Media Constructions of Sustainability:
Middle School

by

Sox Sperry



www.projectlooksharp.org

Providing materials, training, and support to help teachers prepare students for life in today's media-saturated world.



© Copyright 2016 Project Look Sharp – Ithaca College
School of Humanities and Sciences
All Rights Reserved
ISBN: 978-0-9844579-4-6

www.projectlooksharp.org

ITHACA COLLEGE

Mission Statement

Project Look Sharp is a not-for-profit, mission driven initiative committed to providing teachers with the training and materials they need to integrate media literacy, critical thinking and 21st century learning into the curriculum.

Project Look Sharp provides staff development workshops and consulting.

Please Consider Donating

All our curriculum kits are available **free** of charge on our web site.
Please contact *Project Look Sharp* to make a donation.

E-mail:
looksharp@ithaca.edu
PHONE: 607-274-3471
FAX: 607-274-1925

Project Look Sharp
1119 Williams Hall
Ithaca College
Ithaca, NY 14850-7290

About The Kit

This kit provides middle school teachers and community educators with the materials needed to engage students in a dynamic and constructivist process of learning how sustainability has been presented in the media with a particular focus on issues related to energy, biodiversity, climate change and water. Each lesson integrates media literacy and critical thinking with a content focus on a particular aspect of these topics. Themes throughout the kit include

- Human impacts on earth systems,
- Developing possible solutions to environmental challenges,
- Persuasion in media messages,
- Analyzing different points of view,
- Learning to ask good questions.

FAIR USE NOTICE:
The media documents in this kit are provided free of charge for the purpose of commentary, criticism and education as provided by the fair use clause of US Copyright Act of 1976.

Media Constructions of Sustainability: Middle School

By **Sox Sperry**

Managing Editor
Chris Sperry

Publisher & Copy Editor
Sherrie Szeto

Production Materials: Author
Kelsey Greene

Primary Copy Editor
Theodora Weatherby

Executive Director, Project Look Sharp
Cyndy Scheibe

Cover Design & Media Production
Garrett Garneau

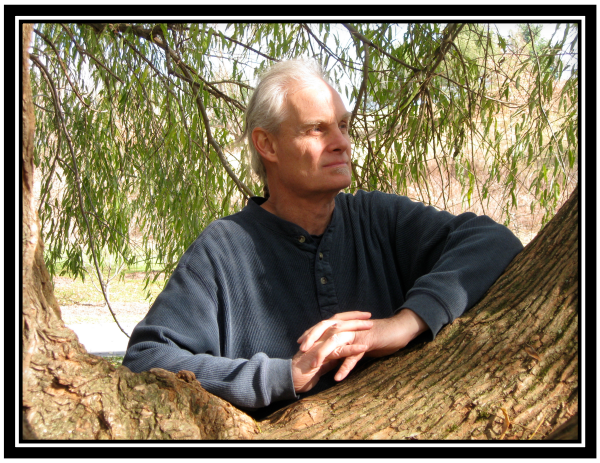
Advisor
Laurie Vanvleet

Major Funding Provided by:
The Park Foundation

© 2015 Project Look Sharp – Ithaca College
School of Humanities and Sciences
1119 Williams Hall
Ithaca, New York 14850
607-274-3471 · looksharp@ithaca.edu · www.projectlooksharp.org

About the Author

Sox Sperry is Program Associate and curriculum writer for Project Look Sharp. Sox began his career as a teacher and curriculum designer in 1974 working at the Learning Center parent-teacher cooperative in Fort Wayne, Indiana. Between 1984 and 2007 he worked at the Center For Nonviolence in Fort Wayne teaching nonviolence, developing curriculum and training trainers for a batterer's intervention program. While in Fort Wayne he also taught peace studies and developed curriculum for the Three Rivers Ensemble.



He is author of Project Look Sharp's document-based history kits, *Media Constructions of Sustainability: Food, Water & Agriculture, Media Constructions of Sustainability: Finger Lakes, Media Construction of Chemicals in the Environment, Media Construction of Endangered Species, Media Construction of Resource Depletion, Media Construction of Peace, Media Construction of Social Justice, Global Media Perspectives* and *Creativity and Aging Through the Lens of Film*. He is co-author with Chris Sperry of *Media Construction of Presidential Campaigns*, *Media Construction of the Middle East* and *Media Constructions of Martin Luther King, Jr*.

The author wants to thank Laurie Vanvleet for her essential role in the creation of this activity collection. Her deep experience in middle school teaching coupled with her interest and expertise in all energy-related media matters helped to make this collection alive and new for me. Thanks to Sherrie Szeto and Cyndy Scheibe for their essential behind the scenes roles in keeping this project on track from start to finish. Finally, as always, thanks to Chris Sperry and Lisa Tsetse. Chris was instrumental in conceiving, designing and editing this kit. It would not be in your hands without his constant and wise stewardship. Lisa was patient and supportive throughout the creation of this kit during a time when that support was deeply needed.

TABLE OF CONTENTS

Introduction.....1
Overview, Objectives, Learning Standards, Accessing Materials 3
How To Use These Materials…….. 7
Media Literacy and Democratic Citizenship…….....13

Theme 1: Energy Sources.....15
Sub-Topic: Coal
Activity Plan 17
Student Handout…….....21
Student Worksheet…….....25
Sub-Topic: Hydropower
Activity Plan 27
Student Handout…….....31
Student Worksheet…….....35
Sub-Topic: Nuclear
Activity Plan 37
Student Handout…….. 41
Student Worksheet…….....45
Sub-Topic: OIl
Activity Plan 47
Student Handout…….....51
Student Worksheet…….....55
Sub-Topic: Solar
Activity Plan 57
Student Handout…….....61
Student Worksheet…….....65
Sub-Topic: Wind
Activity Plan 67
Student Handout…….....71
Student Worksheet…….....75
Sub-Topic: Comparing Renewables
Activity Plan 77
Student Handout…….....81
Student Worksheet…….....83
Sub-Topic: Ethanol
Activity Plan 85
Student Handout…….....89
Student Worksheet…….....91
Sub-Topic: Hydropower Dams
Activity Plan 93
Student Handout…….....97
Student Worksheet…….....99
Sub-Topic: Hydrofracking & Aquifers
Activity Plan 101

Student Handout.....105
Student Worksheet.....109
Sub-Topic: Hydrofracking Pros & Cons
Activity Plan 111
Student Handout..... 115
Student Worksheet.....117

Theme 2: Biodiversity.....119
Sub-Topic: Species Preservation
Activity Plan 121
Student Handout..... 125
Student Worksheet.....129
Sub-Topic: Interrelationships
Activity Plan 131
Student Handout..... 135
Student Worksheet.....139
Sub-Topic: Rachel Carson
Activity Plan 141
Student Handout..... 145
Student Worksheet.....147
Sub-Topic: Climate
Activity Plan 149
Student Handout..... 153
Student Worksheet.....157
Sub-Topic: Habitat Destruction
Activity Plan 159
Student Handout..... 163
Student Worksheet.....167
Sub-Topic: Invasive Species
Activity Plan 169
Student Handout..... 173
Student Worksheet.....177
Sub-Topic: Pollution
Activity Plan 179
Student Handout..... 183
Student Worksheet.....185
Sub-Topic: Trophy Hunting
Activity Plan 187
Student Handout.....191
Student Worksheet.....195
Sub-Topic: Oil Palm Plantations
Activity Plan 197
Student Handout..... 201
Student Worksheet.....205

Theme 3: Climate Change & Water.....207
Sub-Topic: Valuing Water
Activity Plan 209
Student Handout..... 213
Student Worksheet.....217
Sub-Topic: Watersheds
Activity Plan 219
Student Handout..... 223
Student Worksheet.....227
Sub-Topic: Drought Causes
Activity Plan 229
Student Handout.....233
Student Worksheet.....237
Sub-Topic: Drought & Farming
Activity Plan 239
Student Handout..... 243
Student Worksheet.....247
Sub-Topic: Poverty
Activity Plan 249
Student Handout..... 253
Student Worksheet.....257
Sub-Topic: Natural Gas
Activity Plan 259
Student Handout..... 263
Student Worksheet.....265
Sub-Topic: El Nino
Activity Plan 267
Student Handout..... 271
Student Worksheet.....275
Sub-Topic: Extreme Weather
Activity Plan 277
Student Handout.....281
Student Worksheet.....285
Sub-Topic: Sea Level Rise
Activity Plan 287
Student Handout..... 291
Student Worksheet.....293

Theme 4: Video Production.....295
Sub-Topic: Sustainable Stories
Lesson Plan 297
Teacher Guide.....299
Student Materials.....303
Sub-Topic: Sustainable Videos
Lesson Plan 305
Teacher Guide.....307
Student Materials.....311

Introduction to:

Media Constructions of Sustainability: MIDDLE SCHOOL

Overview, Objectives, Learning Standards, Accessing Materials 3

How To Use These Materials…….…….....7

Media Literacy and Democratic Citizenship…….....13

INTRODUCTION

Overview, Objectives, Learning Standards, & Accessing Materials

Overview

This kit provides middle school teachers and community educators with the materials needed to engage students in a dynamic and constructivist process of learning how sustainability has been presented in the media with a particular focus on issues related to energy, biodiversity, climate change and water. Each activity integrates media literacy and critical thinking with a content focus on a particular aspect of these topics. Themes throughout the kit include

- Human impacts on earth systems,
- Developing possible solutions to environmental challenges,
- Persuasion in media messages,
- Analyzing different points of view,
- Learning to ask good questions.

Companion kits dealing with similar topics in the Project Look Sharp environment series include:

- *Media Constructions of Sustainability: Food, Water & Agriculture,*
- *Media Constructions of Sustainability: Finger Lakes (upstate New York),*
- *Media Constructions of Sustainability: Lower Elementary*
- *Media Constructions of Sustainability: Upper Elementary*
- *Media Construction of Global Warming,*
- *Media Construction of the Environment: Chemicals in the Environment,*
- *Media Construction of the Environment: Endangered Species,*
- *Media Construction of the Environment: Resource Depletion.*

Objectives

• Students will learn key information about sustainability as it relates to energy choices, biodiversity, climate change and water.

• Students will analyze and evaluate a variety of perspectives on how earth systems have been impacted by human activity and how people work to help protect human and natural communities.

• Students will be trained to ask and answer key questions about the purposes, content, techniques and impacts of media constructions that help form knowledgeable and well-reasoned opinions.

• Students will engage in complex, reflective, open-minded analysis, and use skeptical critical thinking to develop reading, listening and visual decoding skills and attitudes that support life-long democratic citizenship.

• Students will take well-reasoned and self-reflective positions on controversial issues and consider actions that are consistent with their beliefs and knowledge about sustainability.

Learning Standards

Each activity plan and lesson plan includes a listing of specific standards taught or evaluated in that lesson or activity. This kit addresses specific standards from the following frameworks:

Common Core English Language Arts strands

- Reading in Science & Technical Subjects
- Reading in History/Social Studies

- Writing in History, Science & Technical Subjects
- Speaking & Listening
- Reading: Informational Text

Next Generation Science disciplinary core ideas

- Biodiversity and Humans
- Human Impacts on Earth Systems
- Interdependent Relationships in Ecosystems
- Natural Resources
- The Roles of Water in Earth's Surface Processes
- Global Climate Change

National Council for the Social Studies C3 dimensions

- Developing Questions and Planning Inquiries
- Applying Disciplinary Tools and Concepts in Economics, Geography & History,
- Evaluating Sources and Using Evidence
- Communicating Conclusions and Taking Informed Action

Constructivist Media Decoding

All materials in this collection are designed for teaching with a pedagogy based on the use of constructivist questions that unearth student meaning making and support metacognition.

Constructivist questions are inquiry-based and interactive, inviting collective readings about media construction. They provide opportunities for students to sustain and extend their thinking through consistent probing through questions such as…

- *Who made this document?*
- *For what purpose?*
- *What messages are communicated?*
- *Using what techniques?*

Constructivist questions probe for evidence in the document through questions such as….

- *Where do you see the evidence for that in the document?*
- *How did you arrive at that conclusion from viewing this document?*

Constructivist questions are complex, inviting multiple readings that represent the nuanced interpretations that each individual brings to understanding the meanings within media documents through questions such as…

- *Why do you think that?*
- *How might different people understand this message differently?*

Constructivist questions encourage the development of moral reasoning as students clarify their own interpretations, listen to the analysis of their peers, and discuss ethical issues through questions such as…

- *Why might this matter?*
- *What do you learn about yourself from your interpretation?*
- *What actions might you take in response to this message?*

Access Materials:
Slides, Video and Print

All print and media materials for this kit are available for download free of cost at www.projectlooksharp.org. The media materials include the PowerPoint slideshows, video clips in MP4 format, and print materials as PDFs. Educators will need access to a computer and digital projector or large monitor so that the class can identify key details in each slide and video. For further ideas on how technology can be used to enhance students' interactions with the lesson materials provided, see *How To Use These Materials*. Teachers will want to print and review the lesson and make copies of student readings and assessments prior to instruction.

In the video production lessons, students will be asked to view media documents individually or in small groups in preparation for a class presentation. In these instances, a note will appear in the directions of the ***Teacher Guide*** explaining: *To access student materials, go to the* **Student Materials** *section*

from the Project Look Sharp homepage - www.projectlooksharp.org. Or, you may choose to provide the digital materials directly to your students.

While the kits are available for free online, mobile non-Internet based versions are also available with the purchase of a digital media device. Devices include a master PDF of the kit and all specified media within the activity and lesson folders. This device can be purchased through our website:

www.projectlooksharp.org

INTRODUCTION

How To Use These Materials

Synopsis:
This kit provides teachers with engaging and content-rich media document pairs (slides and videos) that can be used in science, social studies or ELA classes to teach to both content and literacy standards. The activities are designed for classroom media decoding where the teacher leads an inquiry-based process of student analysis/decoding based on carefully selected questions and focused probing by the teacher. The materials include the media documents for analysis – slides or videos, linked to questions for decoding – organized by subject area. In addition there are optional student readings and worksheets to provide background knowledge. While these activities have been designed for middle school classes, they may be easily adapted to other levels.

Lesson Organization
The activities in this kit have been organized within the following framework:

Theme 1 explores energy sources including fossil fuels and renewables.

Theme 2 explores biodiversity with a focus on threats to animal species.

Theme 3 explores climate change and its impact on water resources.

Theme 4 explores video production on sustainability topics.

The activity design for themes 1-3 is consistent in order that teachers and students may become familiar with constructivist media decoding as a process that requires inquiry, reflection, evaluation and drawing conclusions, always leading back to a new round of questioning.

Theme 4 includes 2 lessons that will enable teachers to facilitate student video production activities about sustainability initiatives. The lesson design does not expect teachers to have any background in video production.

Adapt the Curriculum for Your Needs
Although some teachers may elect to teach this curriculum in its entirety, most will select certain lessons, activities or media documents that are best suited to their teaching objectives. This format is intended to be used in a flexible manner based on a teacher's past experience with constructivist media decoding and on students' prior content knowledge of the topic. You might choose to excerpt portions of activities and worksheets to be used as a quick mini-assessment for particular skills, as a five minute opening or ending exercise or as a culminating assessment following a unit of study. We encourage teachers to carefully review the ***Table of Contents***, ***Activity Plans*** and ***Lesson Plans*** in order to determine which activities and lessons might work best for their individual purpose.

Themes 1-3 Media Decoding Activities
As you review the specific steps in the ***Activity Plans*** and ***Teacher Guides*** be prepared to adapt the suggested steps to meet the learning needs of your students. We encourage you to choose "A la carte" among documents and questions rather than thinking you have to use all these elements. For example for a sixth grade class that has never done document decoding you might use only two documents in the energy sources theme. With an eighth grade class that has already done lots of decoding you might use all six document pairs and have them write a synthesis paper comparing all the document pairs.

How to Lead a Media Decoding Activity
Constructivist decoding assumes that each student constructs their own meaning from the interaction between the document (video clip, web page, print article, etc.) and her/his own unique identity (age, experience, views, etc.). It is the role of the teacher to ask questions that

will result in the richest discussions. The art of leading a constructivist decoding is more improvisational than it is scripted – with the teacher fluidly deciding where and how to respond to each student comment - considering how comments might be understood by the other students. The teacher must be open to where student meaning making leads while also staying focused on the learning goals.

The choice of document, questions, structure (e.g. whole group vs. paired work), and facilitation of the analysis should always be driven by the teacher's goals for each activity. The teacher may want to start the decoding with open-ended questions (e.g. *What do you see here?*) to unearth students' background knowledge, interpretations or feelings in response to the media document(s). Or the teacher may want to immediately focus on specific content analysis (e.g. *"What messages are communicated in the text and what messages are communicated in the images?"*). Or the teacher may want to get right to critical literacy questions (e.g. *What is the point of view here about…?)*

We encourage teachers to consider asking questions outside their formal disciplines in order to support teaching that integrates multiple disciplines and encourages systems thinking. Science teachers should consider asking some of the questions in the English language arts and media literacy sets while ELA teachers should look at the social studies and science questions as possible foundations for their reading comprehension and speaking and listening goals.

While the choice of documents and where to probe should always reflect one's goals, typically the decoding will move from more open-ended questions, to content-focused questions and literacy questions as the students move from personal to document-based to more metacognitive thinking. Ultimately the teacher may move to probing that asks students to reflect on their own conclusions (e.g. *Which of these documents best matches your own position and why?)* and action (e.g. *What might you do about it…?*) .

The Project Look Sharp web site includes professional development support for leading a decoding including *Tips for Decoding* and annotated video models illustrating media decoding at different grade levels and for different subject areas (see *Videos about Project Look Sharp*). For a more detailed exploration see the book, *The Teacher's Guide to Media Literacy* by Scheibe and Rogow.

Activity Plans: Organization and Description of Elements

Activities within themes 1-3 are all organized into the following element categories. ***Objective Options*** use language from the disciplinary standards referenced in the ***Standards Options*** table below. The first objective relates to a science core idea. The second objective relates to a social studies concept. The remaining objectives combine English language arts standards and media literacy concepts.

Vocabulary, Media types and thumbnail images offer a quick view of the vocabulary and types of media materials that will be included in each activity

Materials lists the ***Student Handouts*** and ***Student Worksheets*** that you may elect to use. These can be offered as homework or as in-class assignments to be completed prior to the decoding activity. They are intended to give background information in cases where students may not be familiar with the particular content reflected in the media document pair. The handouts are typically excerpts from a website. The worksheets all begin with two pre-reading questions that may be completed prior to reading the handout. Questions 3-6 relate to the content of the handout reading. Questions 7 & 8 are media literacy questions related to sourcing and credibility of the handout. Feel free to skip these materials if students already have the background knowledge required for document decoding. If you elect to use the handouts and worksheets you might encourage students to have them available for reference when they do

the document decoding.

Additional Support notes several professional development materials, most of which are available for free on the Project Look Sharp website, www.projectlooksharp.org. We encourage you to access these materials prior to leading these activities, especially if you've not done constructivist media decoding in the past.

Time reflects a range of times it might take for the activity depending upon your approach. If you want to use this activity as an introductory exercise you might select one or two questions to lead a lively ten-minute classroom decoding. On the other hand you might choose to take more time and ask additional questions to more fully explore the document pairs. The power of the activities emerge when students actively apply their knowledge, identify evidence, articulate their interpretations, analyze authorship and point of view, and discuss meaningful issues.

Activity Procedures are the same for all activities. These should be used flexibly to achieve your teaching objectives.

Connections lists other Project Look Sharp lessons that relate to the topics addressed in each activity. ***Adapted from Project Look Sharp Source*** means that these documents are taken from more involved lessons. You might want to explore these if you'd like to extend the activity with additional media documents or lesson steps. ***Connections to Project Look Sharp Lesson Resources*** link to other lessons with the same or similar content.

Page three of the activity plan offers a series of question sets from which you may choose based on your teaching objectives. Each ***Possible Question for Media Document Decoding*** is based on the particular content of the media documents associated with the activity.

Question sets are broken out by the disciplines linked to the objectives and standards listed at the beginning of the activity plan. Once again we strongly encourage you to look over all the possible questions and not just those specific to your discipline. Rich questioning will easily spill over from science to social studies, from language arts to media literacy and back again.

Follow up Evidence Probe Questions and Comments model some of the questions you might choose to ask to deepen student reading of the media document at hand. Your follow up probes should always be tied to your goals for the activity. For instance, ask, "Tell me more about that," to deepen student questioning and "Does anyone have a better idea?" to solicit multiple interpretations. Ask, "Where do you see that?" to encourage evidence-based awareness and "How do you know?" to raise questions about sourcing and credibility.

The professional development materials referenced in the ***Additional Support*** section of the Activity Plan give more guidance as to when and how to use these follow up probes.

Page four of the activity plan gives several ***Example ELA and Media Literacy Responses.*** These are not suggested as "the right answer" but simply as models for possible evidence-based responses by students that often highlight important details in the documents.

Writing Prompt suggests an assessment question that can be used following document decoding and student worksheets. These questions typically require students to take a position, using evidence from the media documents and the handouts to make their case.

Theme 4 Video Production Lessons

The fourth theme in this kit – video production – has a different structure than the first three themes. Both lessons in this theme include a two-page ***Lesson Plan*** that list objectives, standard alignments, vocabulary, media forms, materials, time required and lesson procedures. The ***Teacher Guide*** includes a step-by-step plan for teaching the lesson. ***Student Worksheets*** and ***Student Handouts*** are designed to help students work though the complex aspects of story conception and video production.

Media Sample Questions & Answers are provided to help with in-class review of student work. ***Further Questions*** and ***Extended Activities*** prompt students to move beyond media-based analysis to discuss issues, make personal connections, conduct follow-up research or take social action. Teachers will add their own questions as a means to encourage holistic understanding.

Accessing Materials
It may be helpful for students to be able to **access videos and PowerPoint slides on their own devices** to enable pausing as needed to make notes and to zoom in on images and text. If these devices are not available you can make print copies of individual PowerPoint slides for close reading. Other options for student viewing and accessing webpage images are to **go directly to URL** (located in the reference list at the end of each slide collection)**.**

Integrating New Technology
Using technology that allows students to interact with the media documents being analyzed can enhance the constructivist media decoding process. Through the use of interactive smart boards, tablet apps and computer programs, students can zoom in for more details or mark supporting evidence. This can also be done through paper and pen or on a projector. Web resources can also be helpful. The website *Vialogues* allows for time-stamped video discussions. The whiteboard app *Explain Everything* allows for narration of compiled presentation.

The use of individual devices can provide further flexibility for students to interact with the media texts since they are able to pause videos when they want, zoom in on distinct parts, or mark up documents with their observations and questions. When students are using their own devices it is advised that teachers devise a way to collect student annotations to capture the individual decoding process. This can be done through PDF editors, remix programs such as The LAMP's *MediaBreaker* for video, or *Mixxx* for audio or Screen capturing software such as *Quicktime, Camtasia* or *Jing*.

The Worksheets provided in the lessons can be used as-is or customized and distributed to students through technology devices.

Do No Harm
One of the key requirements of constructivist pedagogy is to pay deep and constant attention to healing and harmful power of words and images. The issues raised in this curriculum can provoke powerful emotions from students (e.g. responses to the documents related to species extinction. It is essential that the teacher monitors the emotional climate of the class and be willing to ask, "How are you feeling?" It is essential that the teacher create a setting in which personal sharing of feelings will not be obstructed by laughter, side comments or crosstalk that can hurt individuals and make it harder to discuss the sensitive issues that are at the core of this kit.

Teaching Students to Ask Questions
One of the key goals of this curriculum is to help students become better questioners. For example, question six on each worksheet invites students to add two questions of their own about things they'd like to know more about related to the topic. One good follow up question for any decoding is "What additional questions do you have about this media document?" It's important that teachers take the time to engage with students in dialogue about what makes a good question and why.

Teachers can begin this opportunity to practice creative questioning by having a discussion as to why people in general ask questions, why teachers in particular ask questions and what's the value of asking good questions. As they work on these themes you might suggest that students develop their own "question toolbox" in which they begin identifying and organizing questions into different types – *critical thinking* vs. *content* questions or, in the vernacular of the C3 social studies framework, *compelling* vs. *supporting*

questions. An advanced activity might be to invite students to prepare and lead their own document decoding activity, following your model for good inquiry-based questioning.

Scaffolding
There are a wide variety of practices and tools that teachers might consider using to help students enter into media document decoding practice. The simplest of these is to encourage note-taking as students review videos or slides. Be prepared to pause after projecting media documents to allow students to work, alone or together, to deepen their own thinking before opening to full-class discussion. You might want to add to the power point slides your own slides with initial discussion questions, vocabulary and bulleted worksheet directions to help students with auditory processing issues.

Prior to a whole class analysis of the documents you may distribute (digital or printed) document pairs to individuals or small groups. During the whole class analysis these students can lead the decoding of each document pair.

Ask students needing greater challenges to go to the original sources to find out more about the perspectives of the authors and creators of these media materials. Assign students to track down their own "counterpoint examples" for looking at points of view not expressed in the materials presented in the lessons.

Another way to support deepened skills in the area of document decoding is to design skill building across three levels. For students who are new to this process begin with teacher led document decoding as described in the activity plan. As students become more comfortable with the practice consider having them lead the scripted decoding among their peers. Advanced students can harvest their own questions from the offered documents leading original decoding for the whole class.

Professional Development Support
There are many options for further teacher support available on Project Look Sharp's website. These include:

Videos: of teachers using constructivist media decoding in the classroom URL: http://www.projectlooksharp.org/index.php?action=videos&category=media_decoding

Webinars: on topics related to sustainability and media literacy education URL: http://www.projectlooksharp.org/index.php?action=webinars

Articles on media literacy pedagogy URL: http://www.projectlooksharp.org/index.php?action=medialitarticles

Handouts for classroom support URL: http://www.projectlooksharp.org/index.php?action=medialithandouts

Do-It-Yourself (DIY) Guide for integrating media decoding into core content teaching URL: http://www.projectlooksharp.org/index.php?action=diy

Workshop opportunities to hands-on teacher support. URL: http://www.projectlooksharp.org/index.php?action=workshops

We encourage you to make use of all of these as you seek to further incorporate media literacy education into your teaching.

INTRODUCTION

Media Literacy and Democratic Citizenship

The founders of the United States articulated the need for a literate citizenship as core to the development of a deep and enduring democracy. We live in an age when the most influential messages about pressing social issues and events are delivered through mass media, such as television, magazines and the Internet. Most students use the Internet as their primary source of information, yet few have any formal training in assessing the credibility of information in the media. It is essential to the success of our democracy that young people consciously and consistently analyze and evaluate media messages. They need to be taught to seek out current, accurate, and credible sources of information; they need to understand the influence of media messages on their understanding of the world; and they need training in identifying and using various techniques for communicating messages in different media forms. Without these critical skills, we risk losing the diversity and freedom of thought that underpins a culture of true democracy.

Collective Reading of Media Messages

This curriculum is based on the classroom practice of collective reading, in which the teacher leads the class through the process of decoding images, sounds and text as a way of developing a range of critical thinking skills while teaching core knowledge. This constructivist approach encourages the development of moral reasoning as students clarify their own interpretations, listen to the analyses of their peers, and discuss ethical issues. Decoding of the documents in this curriculum will help train students to distinguish fact from opinion, analyze point of view and identify bias, interpret historical documents, and use evidence to back up a thesis. The classroom decoding process is particularly effective in involving students who rarely share their opinions about print-based material, including students with reading disabilities, visual learners, and students for whom English is a second language. The teacher should consider calling on students or going around the room to ensure participation by all students in the collective reading process.

Encouraging Multiple Readings

Although the Teacher Guides for each lesson include possible answers to the questions, the teacher should encourage multiple readings and a diversity of responses for most of the questions posed. It is important that students give evidence in the document to explain their conclusions. Occasionally a question has only one right answer (e.g., "who created this video?"), and students should learn to distinguish between objective and subjective questions. The suggested answers given in the scripts are intended to reflect typical responses that address key scientific, historical and media literacy concepts and information. However, it is important that students recognize that all people do not interpret media messages the same way. Depending upon each reader's background, including life experience, age, gender, race, culture, or political views, he or she may have very different interpretations of a particular text. The collective reading experience provides the opportunity to explore these differences and discuss the important concept that readers interpret messages through their own lenses.

Reading Bias

A major theme of these materials is the recognition that all media messages come from a particular point of view and have a bias that reflects the intent and perspective of the producer and sponsor. With these materials, teachers can train students to recognize bias and point of view. The teacher should encourage students to ask critical questions about any media messages encountered inside or outside the classroom using the Key Questions To Ask When Analyzing Media Messages found at www.projectlooksharp.org.

Bias in this Curriculum and in the Classroom

This series of lessons, like all media, also has a point of view and a bias. As teachers use the lessons, they may identify opinionated language, selective facts, missing information, and many other subjective decisions that went into constructing this view of sustainablitiy. The same questions the curriculum applies to other documents can be applied to this media construction: Who produced this curriculum for what purpose and what is its bias? Teachers and students could and should be asking critical questions about the editorial choices that went into constructing these lessons. For instance, why did we choose to focus on certain topics, but not others? And, what is your evidence for these conclusions? When using these materials teachers will make their own decisions of what to include and to edit, what questions to use and what issues to avoid.

All of these decisions, both by the creators and users of the curriculum, will influence the view of history that students receive. Teachers should encourage students to thoughtfully analyze and discuss the stories, the perspectives, and the biases celebrated and criticized within our own classrooms. Those skills and practices are core to an educated democratic citizenship.

Additional Resources

For more information about media decoding download these documents from the project Look Sharp website:

- ***Key Questions to Ask When Analyzing Media Messages***
- ***Tips for Media Decoding***
- ***Core Principles for Media Literacy Education***

Fair Use of Media Documents

The classroom critique of political and cultural documents (e.g. paintings, TV news clips, excerpts from films, web pages) is essential to the development of core literacy skills in our media saturated democracy. To enable educators to fulfill the mission of teaching these core civic objectives, Project Look Sharp has created media literacy integration kits using a variety of different media documents for critical analysis in the classroom. Project Look Sharp provides these media documents and lessons free of charge for the purpose of commentary, criticism, and education as provided for by the fair use clause of the US Copyright Act of 1976. The documents in this curriculum are presented for the purpose of direct critique and are solely to be used in an educational setting.

For more information about fair use in Media Literacy Education, go to the Media Education Lab at Temple University at www.mediaeducationlab.com.

THEME 1: ENERGY SOURCES

Sub-Topic: Coal
Activity Plan 17
Student Materials.....21
Sub-Topic: Hydropower
Activity Plan 27
Student Materials.....31
Sub-Topic: Nuclear
Activity Plan 37
Student Materials.....41
Sub-Topic: OIl
Activity Plan 47
Student Materials.....51
Sub-Topic: Solar
Activity Plan 57
Student Materials.....61
Sub-Topic: Wind
Activity Plan 67
Student Materials.....71
Sub-Topic: Comparing Renewables
Activity Plan 77
Student Materials.....81
Sub-Topic: Ethanol
Activity Plan 85
Student Materials.....89
Sub-Topic: Hydropower Dams
Activity Plan 93
Student Materials.....97
Sub-Topic: Hydrofracking & Aquifers
Activity Plan 101
Student Materials.....105
Sub-Topic: Hydrofracking Pros & Cons
Activity Plan 111
Student Materials.....115

ACTIVITY PLAN

Coal: Benefits and Costs

PowerPoint

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

- Students will consider how human use of natural resources for energy affects the biosphere.
- Students will compare the benefits and costs of energy source choices.
- Students will read and analyze visual and print information in diverse texts.
- Students will identify and distinguish conflicting claims about energy source impacts.
- Students will cite specific textual evidence to support analysis of science texts.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.A
	ESS3.C
C3 Framework Social Studies Dimension 2 Concepts	D2.Eco.2.6-8
	D2.Geo.4.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.7
	CCSS.ELA-LITERACY.WHST.6-8.1.A
	CCSS.ELA-LITERACY.RST.6-8.1

Vocabulary:

coal, energy security, renewable energy, nonrenewable energy

Media Type(s): web page



The High Cost of Cheap Coal Magazine opening spread: National Geographic, 2006



Coal: The Foundation of American Security Magazine cover: American Coal, 2006

Preparation and Materials:

*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use Materials* section.

Preparation:
- Download and review the *How to Use Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: How Coal Works*
- Two-page *Student Worksheet: The Future of Coal*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Sustainability: Upper Elementary – Unit 2: Natural Resources, Lesson 1

Connections to Project Look Sharp Lesson Resources:
Economics in U.S. History, Lesson 4: Raising Funds for War, slides 11 & 12
Media Constructions of Social Justice, Unit 3: Early Labor Movement, lesson 2, video 4

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- What natural resource is depicted in this media example?
- Is this energy source renewable or nonrenewable?
- How does burning coal impact the biosphere?

Social Studies

- What are the benefits and costs of the energy source represented in this media example?
- How do the decisions to use this energy source influence the local and global environment?

ELA

- What messages are suggested by the visual image and what messages by the text?
- What evidence do you see in the document to support your analysis of the message?
- How do the claims about the energy source differ in each media example?

Media Literacy

- Who might benefit from this message and who might be harmed by it?
- What points of view about energy and technology are implied by this media document?
- What is left out of this message that might be important to know?
- What would you need to know to assess the credibility of these media documents?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?

Writing Prompt for synthesis assessment in the sub-topic, *Energy Choices*

Summarize the costs and benefits of selected energy choices. Take a position about which source or sources best meet the needs of your community and why.

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested by the visual image and what messages by the text? How do the claims about the energy source differ in each media example? What evidence do you see in the document to support your analysis of the message?
Possible Answer: Doc 1: Image – Coal pollutes the biosphere.
Text – Coal is a costly energy source despite its low cost.
Evidence: Image - The smoke stacks release smoke and the coal pile towers over the earth.
Text – *The High Cost of Cheap Coal*
Possible Answer: Doc 2: Images – Coal is a patriotic energy source.
Text – American coal fuels U.S. economic strength.
Evidence: Images – U.S. flag rooted in a large chunk of coal.
Text – *Foundation of American Energy Security; American Coal: Abundant, Economic*

Media Literacy

Question: Who might benefit from this message and who might be harmed by it?
Possible Answers: Doc 1 might benefit people seeking to shift away from coal-powered plants in favor of other energy sources.
Doc 1 might harm the coal industry in general by urging people to consider the environmental impacts of mining and burning coal.
Doc 2 might benefit the American Coal Council and the industry it represents by encouraging support for coal as sustainable and economical.
Doc 2 might harm those who argue against coal power by making coal seem like a patriotic energy source that protects our nation's economic security.

Question: What is left out of this message that might be important to know?

Possible Answers: Doc 1 doesn't address the economic benefits of coal. What parts of our country depend on coal for their economic survival? What will happen to jobs created by the mining and coal industry? How much will it cost to shift from dependence on coal as a major energy source?
Doc 2 leaves unanswered questions about the impact of coal on the biosphere. How does coal impact air and water resources?

Question: What would you need to know to assess the credibility of these media documents?

Possible Answers: **Doc 1**: Do all modern coal plants release visible emissions? Is the foreground pyramid a coal pile? Does this magazine article address how coal compares with other energy sources in energy production and cost?
Doc 2: Are there new sources of renewable energy that can replace coal as an economical energy foundation for the U.S. economy? In what way is coal "environmentally sound" as suggested in the subtitle to this magazine?

ENERGY > COAL AND OTHER FOSSIL FUELS

How Coal Works

Contents

- How Coal Forms >
- How Coal Is Mined >
- Where Our Coal Comes From >
- How Coal Is Transported And Refined >
- How Coal is Burned >
- A Case Study: The Side Effects of a Coal Plant >
- The Future of Coal >
- Learn More about Our Coal Use >
- Further Reading >

Coal is cheap, plentiful and dirty -- as cheap as dirt, as plentiful as dirt, and as dirty as dirt -- since after all, coal is little more than dirt that burns.

Thirty years ago, coal was seen as a fuel of the past. Nuclear power and natural gas were going to take us away from the Dickensian era of coal furnaces, steam-powered locomotives, and grime. But King Coal recovered, and is now used in record amounts. Forecasts of future energy use give a prominent role to coal. Some would say that coal is back, and here to stay.

But coal is an unwelcome guest. Carbon emissions from burning coal are one of the leading causes of global warming. Acid rain, from sulfur emissions, is almost entirely due to coal burning. From mining to processing to transportation to burning to disposal, coal has more environmental impacts than any other energy source. While some of these can be lessened with effort, others, like carbon emissions, are an inevitable product of coal use. Its time to send our dirty old King into retirement.

The Future of Coal

Coal is abundant in America, and in many countries around the world. The amount of coal that can be mined at a competitive price in the U.S. is currently estimated at about 265 billion short tons. This is evenly divided between low-sulfur coal in the West (100 billion tons), medium-sulfur coal in the West and Appalachia (80 billion) and high-sulfur coal in the Midwest and Appalachia. Underground mining is required for about two-thirds of U.S. coal reserves; the rest can be surface mined.

Annual coal production is projected to remain around 1 billion tons into the next century. At a steady rate of use, our coal won't be depleted for 265 years. At a rate of growth of only two percent per year, however, this depletion occurs after 93 years. At a growth rate of 3 percent, it happens at 73 years.

But while physical supplies of coal may be substantial, and production costs are low, other factors may limit coal use. Pollution controls can remove a significant part of the sulfur and particulate emissions, if properly monitored and maintained. Even so, the environmental impacts of coal are enormous.

[SHARE]

[FROM OUR BLOGS]

Tenth Anniversary Release of UCS Satellite Database
LAURA GREGO | MARCH 3, 2016

A Good Chemical Safety Law Depends on Us
CELIA WEXLER | MARCH 3, 2016

Mis-steps at Indian Point Nuclear Plant
DAVE LOCHBAUM | MARCH 1, 2016

[ON TWITTER]

Concerned Scientists Retweeted
Todd Wolf
@UCSTodd
Thanks to FL Mayors trying to get #climatechange into presidential debates pinecrest-fl.gov/Modules/ShowDo...
28m

Concerned Scientists Retweeted
The Science Network
@SciNetUCS
.@UCSUSA is hiring an energy modeler for our sunny West Coast office. Interested? ucsusa.org/about/jobs-ucs...
3h

Concerned Scientists Retweeted
Post Green

[TAKE ACTION]



The Supreme Court's recent ruling on the Clean Power Plan is a speed bump, not a stop sign. Urge your governor to move forward with state plans to act on climate change and transition to renewable energy.

Tell your governor to power ahead on the Clean Power Plan. >

And despite the many innovative coal combustion technologies being developed, the only practical way to reduce carbon dioxide emissions from coal is to get more energy out of each pound of coal -- to increase the efficiency. But the efficiency of typical coal plants has peaked at about 33 percent, limited mostly by their steam turbines. What doesn't become electricity becomes waste heat.

The first way to increase the efficiency of turning coal into electricity is to capture the waste heat. "Cogeneration," the generation of heat and power together, is a well-known technology, but is not always applied. One method of cogeneration is to use the waste heat to warm nearby buildings. Such "district heating" systems are common in northern Europe, but are rarely used in the US.

Utilities in New York and Wisconsin are experimenting with ways to burn to biomass along with coal in power plants. In New York, fast-growing willow trees are chopped up and mixed with coal; in Wisconsin, switchgrass is being used. Sometimes when biomass is burned alone in a conventional furnace, the temperatures are too low to clean out all the residue, and a slag builds up in the furnace. By burning the biomass with coal, slagging problems are minimized and carbon and sulfur emissions are reduced.

Another technology under development is the coal gasification combustion turbine (CGCT). In this approach, coal is heated until it gives off volatile gases, such as methane, which are burned in a gas turbine. After this hot air passes though a gas turbine, it is used to heat water which drives a steam turbine. This combined cycle is more efficient than steam turbines alone, with efficiencies approaching 50 percent. By gasifying the coal first, emissions are reduced as well. This approach is also being applied to biomass.

An approach with even lower carbon emissions is to run the coal gas through a fuel cell. Fuel cells are battery-like devices that convert hydrogen-rich gases, such as methane, into electricity without combustion. Using pure hydrogen, fuel cells are almost 80 percent efficient. Since gasified coal would contain a number of impurities, notably carbon, the gas would have to be cleaned up significantly. Cost effective cleaning techniques are still under development.

A final approach, still in the research stage, is magnetohydrodynamics, or MHD. With MHD, superheated gases from coal combustion blast through a magnetic field created by superconducting magnets, producing an electric charge as they pass. The gases then power a conventional gas turbine, extracting as much energy as possible from the heat. In this combined-cycle approach, efficiency can get up to 50 or 60 percent. Interest in MHD may be waning though, due to some fundamental technical difficulties. In an MHD plant, gases at 2000 degrees celsius pass through a duct at supersonic speeds, just centimeters away from magnets that must be kept a few degrees above absolute zero (-273 degrees celsius). Since gasified coal run through combined-cycle plants can be nearly as efficient, and offer many fewer engineering problems, MHD is unlikely to be developed commercially.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

Despite all of these advanced techniques, it may never be possible to produce energy from coal without carbon emissions. Most of the heat produced from coal is generated from carbon, which provides more than 70 percent of the energy content. Since there is so much coal in the world, and the cost of extracting it is so low, it will take a concerted effort to avoid massive carbon emissions. More efficient use is a start, but replacing coal with renewables is the ultimate solution to the environmental impacts of coal.

Learn More about Our Coal Use

- Smart Energy Solutions: Decrease Coal Use

In-Depth Analysis and Reports

- Ranking the States that Import the Most Coal (2014)
- An Economic Analysis of the U.S. Coal Fleet (2013)
- Ripe for Retirement: The Case for Closing America's Costliest Coal Plants (2012)
- A Risky Proposition: The Financial Hazards of New Investments in Coal Plants (2011)
- Burning Coal, Burning Cash: Ranking the States that Import the Most Coal (2010)
- Coal Power in a Warming World: Investing in Carbon Capture and Storage (2008)

Further Reading

- Scientific American, *Energy for Planet Earth*, Chapter 8, "Energy from Fossil Fuels," 1991.
- "The Future for Coal," *New Scientist*, January 23, 1993, pp. 20-41.
- Coal Combustion
- DOE's Coal Information Page

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- The Future of Coal

Pre-reading questions:

1. Before you read the text on the future of coal as an energy source, take a moment and consider what you might know already about the future of coal as an energy source What are some of the arguments for and against burning coal for energy?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post-reading questions:

3. Complete the reading and answer the post reading questions. List four innovative coal combustion technologies that attempt to increase the efficiency of burning coal.

4. Describe several of the environmental impacts from coal burning.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. The authors begin the article by noting that coal is abundant and inexpensive. What are their main arguments for why coal should be replaced as an energy source?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

PPT
PowerPoint

Hydropower: Benefits and Costs

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

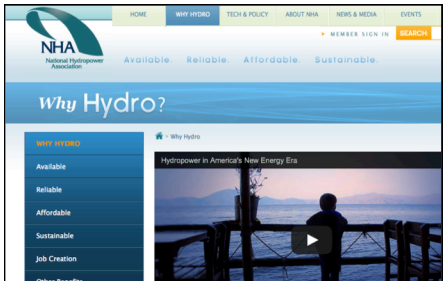
Objective Options:

- Students will consider how human use of natural resources for energy affects the biosphere.
- Students will compare the benefits and costs of energy source choices.
- Students will read and analyze visual and print information in diverse texts.
- Students will identify and distinguish conflicting claims about energy source impacts.
- Students will cite specific textual evidence to support analysis of science texts.

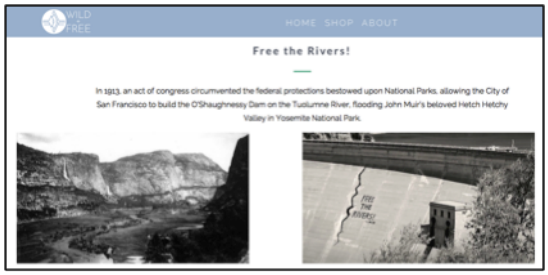
Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.A
	ESS3.C
C3 Framework Social Studies Dimension 2 Concepts	D2.Eco.2.6-8
	D2.Geo.4.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.7
	CCSS.ELA-LITERACY.WHST.6-8.1.A
	CCSS.ELA-LITERACY.RST.6-8.1

Vocabulary:
hydropower, John Muir

Media Type(s): web page



Why Hydro? Webpage: National Hydropower Association, 2015



Free the Rivers Web page: Wild & Free Project, 2015

Preparation and Materials:

*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use Materials* section.

Preparation:
- Download and review the *How to Use Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: Hydroelectric Power: How it Works*
- Two-page *Student Worksheet: Hydroelectric Power*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Sustainability: Upper Elementary – Unit 2: Natural Resources, Lesson 1

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Sustainability: Middle School – Energy Sources: Hydropower Dams
Media Constructions of Resource Depletion, Lesson 1, slide 13
Media Constructions of Resource Depletion, Lesson 2, Damming the Rivers

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- What natural resource is depicted in this media example?
- Is this energy source renewable or nonrenewable?
- How does hydropower impact the biosphere?

Social Studies

- What are the benefits and costs of the energy source represented in this media example?
- How do the decisions to use this energy source influence the local and global environment?

ELA

- What messages are suggested by the visual image and what messages by the text?
- What evidence do you see in the document to support your analysis of the message?
- How do the claims about the energy source differ in each media example?

Media Literacy

- Who might benefit from this message and who might be harmed by it?
- What points of view about energy and technology are implied by this media document?
- What is left out of this message that might be important to know?
- What would you need to know to assess the credibility of these media documents?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?

Writing Prompt for synthesis assessment in the sub-topic, *Energy Choices*

Summarize the costs and benefits of selected energy choices. Take a position about which source or sources best meet the needs of your community and why.

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested by the visual image and what messages by the text? How do the claims about the energy source differ in each media example? What evidence do you see in the document to support your analysis of the message?
Possible Answer: Doc 1: Image – Water is an abundant energy source for the future.
Text – Hydropower is a good economic choice for long-term energy supply.
Evidence: Image - The young boy looks to an endless horizon of water.
Text – Menu tabs: *affordable, job creation, available, reliable, sustainable*
Possible Answer: Doc 2: Images – Dams impound natural rivers.
Text – Dams destroy river environments that should remain natural and free.
Evidence: Images – Before and after photos of dammed landscape.
Text – *Free the Rivers! Dam on the…river, flooding John Muir's beloved…valley*.

Media Literacy

Question: Who might benefit from this message and who might be harmed by it?
Possible Answers: Doc #1 might benefit the National Hydropower Association and the industry it represents by encouraging support for hydro as sustainable and economical.
Doc 1 might harm those who argue against big hydropower projects by making hydro seem like an abundant energy source that protects our children's future.
Doc 2 might benefit people seeking to decommission dams and those working against large hydropower projects by presenting the destruction of natural river environments.
Doc 2 might harm the hydropower industry in general by urging people to "free the rivers" and decommission large dams.

Question: What is left out of this message that might be important to know?
Possible Answers: Doc 1 leaves unanswered the questions about the impact of hydropower on natural environments.
Doc 2 doesn't address the economic benefits of hydropower. Where will our drinking water come from? What will happen to jobs created by building and maintaining dams and the reservoir recreation businesses that big hydropower projects support?

Question: What would you need to know to assess the credibility of these media documents?
Possible Answers: **Doc 1**: Does this website include hydropower options that don't involve destroying river ecosystems? Does this website address how hydropower compares with other energy sources in energy production and cost?
Doc 2: Is the dam in the image on the right in the same location as the archival image on the left? Was the graffiti in the original photo? Were there laws in 1913 to keep the Hetch Hetchy Valley from development?

USGS science for a changing world

USGS Home
Contact USGS
Search USGS

The USGS Water Science School

Search... Search

Links Glossary Site map Help

Home | Water Basics | Water Properties | Water Cycle (Adults) | Water Cycle (Kids) | Surface Water | Groundwater | Water Quality | Water Use | Activities | Photos | Q&A | Teachers | Contact

Back to previous page

Hydroelectric power: How it works

Learn More

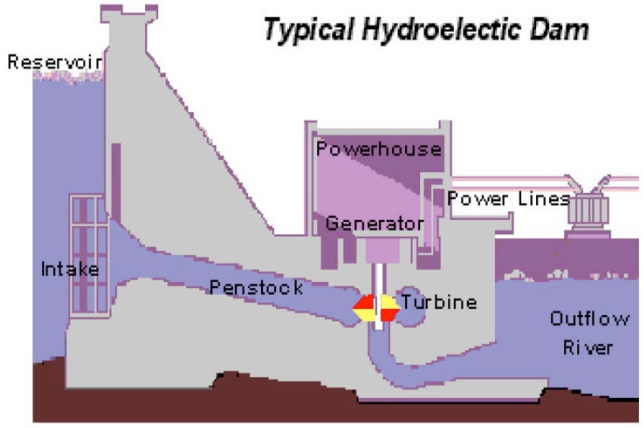
Hydroelectric power

- Hydroelectric power and water
- How hydroelectric power plants work
- World's largest hydro facility
- Advantages of hydroelectricity

USGS publications

- Sustainability of Ground-Water Resources, USGS Circular 1186

References



So just how do we get electricity from water? Actually, hydroelectric and coal-fired power plants produce electricity in a similar way. In both cases a power source is used to turn a propeller-like piece called a turbine, which then turns a metal shaft in an electric generator, which is the motor that produces electricity. A coal-fired power plant uses steam to turn the turbine blades; whereas a hydroelectric plant uses falling water to turn the turbine. The results are the same.

New!



Water cycle for kids poster.

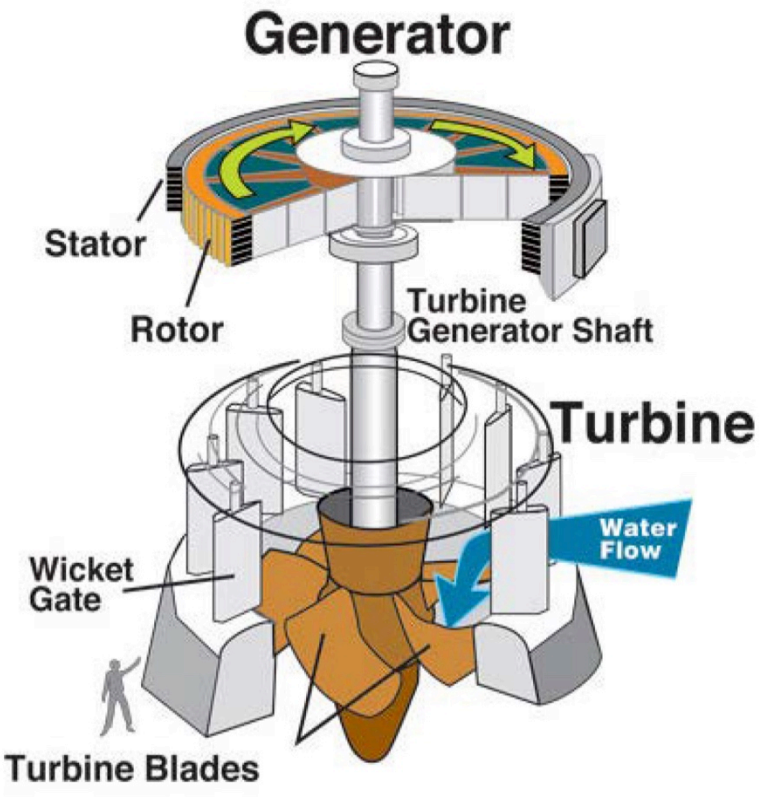
Take a look at this diagram (courtesy of the Tennessee Valley Authority) of a hydroelectric power plant to see the details:

References

- The Foundation for Water Education and Energy (FWEE)
- EPA: Energy Kids
- The Nature of Water: Environment Canada
- Hydroelectric power - US Dept. of the Interior; Bureau of Reclamation

see the details:

The theory is to build a dam on a large river that has a large drop in elevation (there are not many hydroelectric plants in Kansas or Florida). The dam stores lots of water behind it in the reservoir. Near the bottom of the dam wall there is the water intake. Gravity causes it to fall through the penstock inside the dam. At the end of the penstock there is a turbine propeller, which is turned by the moving water. The shaft from the turbine goes up into the generator, which produces the power. Power lines are connected to the generator that carry electricity to your home and mine. The water continues past the propeller through the tailrace into the river past the dam. By the way, it is not a good idea to be playing in the water right below a dam when water is released!

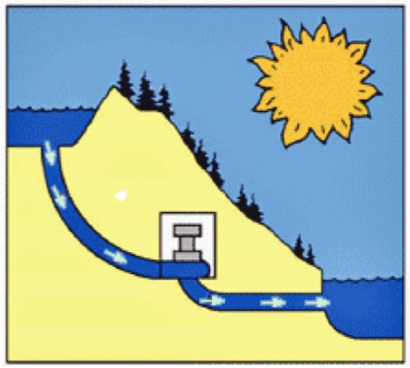


This diagram of a hydroelectric generator is courtesy of U.S. Army Corps of Engineers.

As to how this generator works, the Corps of Engineers explains it this way:
"A hydraulic turbine converts the energy of flowing water into mechanical energy. A hydroelectric generator converts this mechanical energy into electricity. The operation of a generator is based on the principles discovered by Faraday. He found that when a magnet is moved past a conductor, it causes electricity to flow. In a large generator, electromagnets are made by circulating direct current through loops of wire wound around stacks of magnetic steel laminations. These are called field poles, and are mounted on the perimeter of the rotor. The rotor is attached to the turbine shaft, and rotates at a fixed speed. When the rotor turns, it causes the field poles (the electromagnets) to move past the conductors mounted in the stator. This, in turn, causes electricity to flow and a voltage to develop at the generator output terminals."

Pumped storage: Reusing water for peak electricity demand

Demand for electricity is not "flat" and constant. Demand goes up and down during the day, and overnight there is less need for electricity in homes, businesses, and other facilities. For example, here in Atlanta, Georgia at 5:00 PM on a hot August weekend day, you can bet there is a huge demand for electricity to run millions of air conditioners! But, 12 hours later at 5:00 AM .... not so much. Hydroelectric plants are more efficient at providing for peak power demands during short periods than are fossil-fuel and nuclear power plants, and one way of doing that is by using "pumped storage", which reuses the same water more than once.



Daytime: Water flows downhill through turbines, producing electricity



Nightime: Water pumped uphill to reservoir for tomorrow's use

Pumped storage is a method of keeping water in reserve for peak period power demands by pumping water that has already flowed through the turbines back up a storage pool above the powerplant at a time when customer demand for energy is low, such as during the middle of the night. The water is then allowed to flow back through the turbine-generators at times when demand is high and a heavy load is placed on the system.

The reservoir acts much like a battery, storing power in the form of water when demands are low and producing maximum power during daily and seasonal peak periods. An advantage of pumped storage is that hydroelectric generating units are able to start up quickly and make rapid adjustments in output. They operate efficiently when used for one hour or several hours. Because pumped storage reservoirs are relatively small, construction costs are generally low compared with conventional hydropower facilities.

To view PDF files, the latest version of Adobe Reader (free of charge) or similar software is needed.

Accessibility FOIA Privacy Policies and Notices

U.S. Department of the Interior | U.S. Geological Survey
URL: http://water.usgs.gov/edu/hyhowworks.html
Page Contact Information: Howard Perlman
Page Last Modified: Friday, 07-Aug-2015 13:59:23 EDT

NAME _____ **DATE** _____

Student Worksheet- Hydroelectric Power

Pre-reading questions:

1. Before you read the text on how hydroelectric works, take a moment and consider what you might know already about how water might produce energy. What might be needed to make this work?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post-reading questions:

3. Complete the reading and answer the post reading questions. Refer to the diagram and describe how the flow of water produces electricity.

4. Describe how the use of a turbine is similar to what happens in a coal burning plant.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. Explain the role of the generator.

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the left. How do the references affect your rating of the credibility of the overall web page?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

Nuclear: Benefits and Costs

PowerPoint

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

- Students will consider how human use of natural resources for energy affects the biosphere.
- Students will compare the benefits and costs of energy source choices.
- Students will read and analyze visual and print information in diverse texts.
- Students will identify and distinguish conflicting claims about energy source impacts.
- Students will cite specific textual evidence to support analysis of science texts.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.A
	ESS3.C
C3 Framework Social Studies Dimension 2 Concepts	D2.Eco.2.6-8
	D2.Geo.4.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.7
	CCSS.ELA-LITERACY.WHST.6-8.1.A
	CCSS.ELA-LITERACY.RST.6-8.1

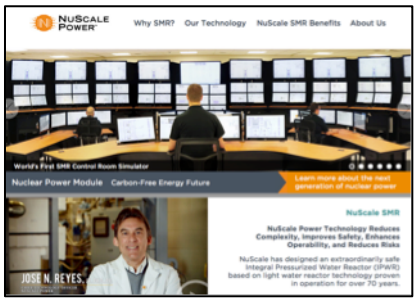
Vocabulary:

nuclear power, nuclear accident, control room, light water reactor technology

Media Type(s): web pages



Nuclear Power Accidents
Web page: Union of Concerned Scientists, 2016



Nuclear Power Module
Web page: NuScale Power, 2016

Preparation and Materials:

*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use Materials* section.

Preparation:
- Download and review the *How to Use Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: Nuclear Power Plants*
- Two-page *Student Worksheet: Nuclear Power Safety*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Sustainability: Upper Elementary – Unit 2: Natural Resources, Lesson 1

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Chemicals in the Environment, Lesson 4: Nuclear Reactor Safety

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- What natural resource is depicted in this media example?
- Is this energy source renewable or nonrenewable?
- How does nuclear power impact the biosphere?

Social Studies

- What are the benefits and costs of the energy source represented in this media example?
- How do the decisions to use this energy source influence the local and global environment?

ELA

- What messages are suggested by the visual image and what messages by the text?
- What evidence do you see in the document to support your analysis of the message?
- How do the claims about the energy source differ in each media example?

Media Literacy

- Who might benefit from this message and who might be harmed by it?
- What points of view about energy and technology are implied by this media document?
- What is left out of this message that might be important to know?
- What would you need to know to assess the credibility of these media documents?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?

Writing Prompt for synthesis assessment in the sub-topic, *Energy Choices*

Summarize the costs and benefits of selected energy choices. Take a position about which source or sources best meet the needs of your community and why.

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested by the visual image and what messages by the text? How do the claims about the energy source differ in each media example? What evidence do you see in the document to support your analysis of the message?
Possible Answer: Doc 1: Image – Nuclear power is hazardous.
Text – Nuclear power accidents can be catastrophic.
Evidence: Image – The nuclear power workers wear protective clothing and respirators.
Text – *The consequences can be catastrophic; accidents and failures…serious threats*
Possible Answer: Doc 2: Image – Nuclear power safety is managed by skilled professionals.
Text – Nuclear power plants provide safe energy.
Evidence: Image – Team of workers focused on computer screens; man in lab coat
Text – *Improves safety; reduces risks; extraordinarily safe; proven in operation*

Media Literacy

Question: Who might benefit from this message and who might be harmed by it?
Possible Answers: Doc 1 might benefit everyone living near a nuclear power plant and people who are working to keep them safe.
Doc 1 might harm the nuclear industry in general by urging people to consider the potential catastrophic danger of nuclear accidents.
Doc 2 might benefit the nuclear industry by encouraging support for nuclear power as a safe and carbon-free energy source.
Doc 2 might harm nuclear power opponents by making nuclear technology seem like a secure and reliable energy source. .

Question: What is left out of this message that might be important to know?
Possible Answers: Doc 1 doesn't address the particular safety guards of the light water reactors. **Doc 2** leaves unanswered the questions about the threats to nuclear plants from natural disasters.

Question: What would you need to know to assess the credibility of these media documents?
Possible Answers: **Doc 1**: Who are the UCS experts and what makes their analysis credible? Who conducted the special investigation at the Oconnee plant referenced in the blog post (lower right) and what are their credentials?
Doc 2: Have there been independent studies of the safety and reliability of the light water reactor technology? What do these studies conclude and do the conclusions point to consensus among the researchers? Has NuScale Power ever been involved in nuclear power accidents? If so, did they take responsibility for correcting problems?

EXPLAINTHATSTUFF!
Google™ Custom Search
You are here: Home page > Energy > Nuclear power plants
Home | A-Z index | Get the book | Follow us | Random article | Timeline | Teaching guide | About us | Privacy policy



Nuclear power plants

Like 104 11
Tweet

by Chris Woodford. *Last updated: September 16, 2015.*

Advertisement
The Power System Basics
ieee-pes.org/plaintalk
IEEE PES Plain Talk Online Register for Our June 14 Course
Silversea® Senior Cruises
Utility bill too high?
High Pressure Reactor

Atomic energy has had a mixed history in the half-century or so since the world's first commercial nuclear power plant opened at Calder Hall (now Sellafield) in Cumbria, England in 1956. Huge amounts of world energy have been produced from atoms ever since, but amid enormous controversy. Some people believe nuclear power is a vital way to tackle climate change; others insist it is dirty, dangerous, uneconomic, and unnecessary. Either way, it helps if you understand what nuclear energy is and how it works—so let's forget the politics for a moment and take a closer look at the science.

Photo: Nuclear energy—the past or the future? Sleek modern solar panels in the foreground with the now-decommissioned Rancho Seco nuclear plant, Sacramento, California, right behind them. Will nuclear energy tide us over until we can convert the world to renewable energy? Or is it an expensive distraction? Photo by Warren Gretz courtesy of US DOE/NREL (US Department of Energy/National Renewable Energy Laboratory).

What is a chain reaction?

What if you could make lots of atoms split up one after another? In theory, you could get them to release a huge amount of energy. If breaking up billions of atoms sounds like a real bore (like breaking billions of eggs to make an omelet), there's one more handy thing that helps: some radioactive isotopes will go on splitting themselves automatically in what's called a **chain reaction**, producing power for pretty much as long as you want.

Suppose you take a really heavy atom—a stable kind of uranium called uranium-235. Each of its atoms has a nucleus with 92 protons and 143 neutrons. Fire a neutron at uranium-235 and you turn it into uranium-236: an unstable version of the same atom (a radioactive isotope of uranium) with 92 protons and ***144 neutrons*** (remember that you fired an extra one in). Uranium-236 is too unstable to hang around for long so it splits apart into two much smaller atoms, barium and krypton, releasing quite a lot of energy and firing off three spare neutrons at the same time.

Now the brilliant thing is that the spare neutrons can crash into other uranium-235 atoms, making them split apart too. And when each of those atoms splits, it too will produce spare neutrons. So a single fission of a single uranium-235 atom rapidly becomes a chain reaction—a runaway, nuclear avalanche that releases a huge amount of energy in the form of heat.

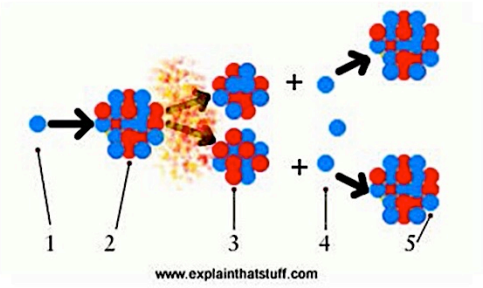


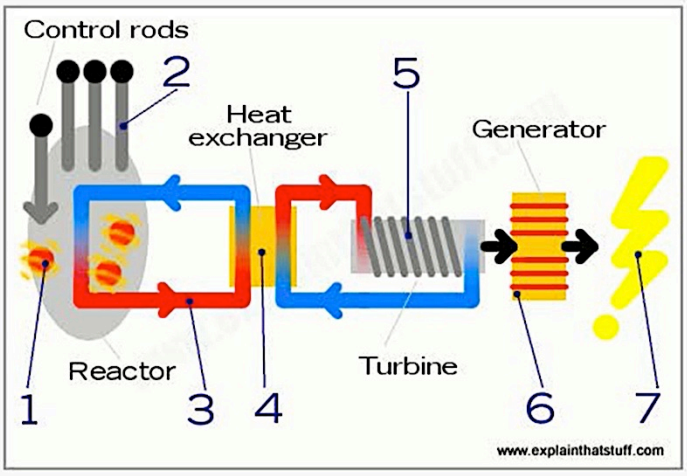
Photo: Chain reaction! Fire a neutron (1) at a large uranium-235 atom (2). You make an even larger, unstable radioactive isotope of uranium, uranium-236, that promptly splits into two smaller and more stable atoms krypton and barium (3). In the process, heat energy is released and there are three spare neutrons left over (4). The neutrons can go on to react with more uranium-235 atoms (5) in a hugely energetic chain reaction. Other fission reactors are possible when a neutron hits uranium-235, producing either two or four spare neutrons. That's why (confusingly) you'll sometimes read in books that uranium-235 fission produces "two or three" spare neutrons (and an average of 2.47) per reaction.

What's the difference between a nuclear power plant and a nuclear bomb?

In a nuclear bomb, the chain reaction isn't controlled, and that's what makes nuclear weapons so terrifyingly destructive. The entire chain reaction happens in a fraction of a second, with one splitting atom producing two, four, eight, sixteen, and so on, releasing a massive amount of energy in the blink of an eye. In nuclear power plants, the chain reactions are very carefully controlled so they proceed at a relatively slow rate, just enough to sustain themselves, releasing energy very steadily over a period of many years or decades. There is no runaway, uncontrolled chain reaction in a nuclear power plant.

How does a nuclear power plant work?

Okay, we've figured how to get energy from an atom, but the energy we've got isn't that helpful: it's just a huge amount of heat! How do we turn that into something much more useful, namely electricity? A nuclear power plant works pretty much like a conventional power plant, but it produces heat energy from atoms rather than by burning coal, oil, gas, or another fuel. The heat it produces is used to boil water to make steam, which drives one or more giant steam turbines connected to generators—and those produce the electricity we're after. Here's how:



1. First, uranium fuel is loaded up into the reactor—a giant concrete dome that's reinforced in case it explodes. In the heart of the reactor (the core), atoms split apart and release heat energy, producing neutrons and splitting other atoms in a carefully controlled nuclear reaction.
2. Control rods made of materials such as cadmium and boron can be raised or lowered into the reactor to soak up neutrons and slow down or speed up the chain reaction.
3. Water is pumped through the reactor to collect the heat energy that the chain reaction produces. It constantly flows around a closed loop linking the reactor with a heat exchanger.
4. Inside the heat exchanger, the water from the reactor gives up its energy to cooler water flowing in another closed loop, turning it into steam. Using two unconnected loops of water and the heat exchanger helps to keep water contaminated with radioactivity safely contained in one place and well away from most of the equipment in the plant.
5. The steam from the heat exchanger is piped to a turbine. As the steam blows past the turbine's vanes, they spin around at high speed.
6. The spinning turbine is connected to an electricity generator and makes that spin too.
7. The generator produces electricity that flows out to the power grid—and to our homes, shops, offices, and factories.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

Can a nuclear power plant explode like a nuclear bomb?



Artwork: Nuclear explosion: Oil painting of a Pacific nuclear test at Bikini Atoll in the 1950s by war artist Charles Bittinger courtesy of the US Naval History and Heritage Command, (classified as public domain).

One reason many people oppose nuclear power is because they think nuclear plants are like enormous nuclear bombs, just waiting to explode and wipe out civilization. It's true that nuclear plants and nuclear bombs are both based on nuclear reactions in which atoms split apart, but that's generally where the similarity begins and ends.

To start with, very different grades of uranium are used in power plants and nuclear bombs (some bombs use plutonium, but that's another story). Bombs need extremely pure (**enriched**) uranium-235, which is made by removing contaminants (notably another isotope of uranium, uranium-238) from naturally occurring uranium. Unless the contaminants are removed, they stop a nuclear chain reaction from occurring. Power plants can work with less purified, much more ordinary uranium providing they add another substance called a **moderator**. The moderator, typically made of carbon or water, effectively "converts" the less pure uranium so it will allow a chain reaction to happen. (I won't go into the details here, but it works by slowing down neutrons so they are less readily absorbed by any uranium-238 impurities and have a greater chance of causing fission in the all-important uranium-235.) All we really need to know about the moderator is that it makes a chain reaction possible in relatively impure uranium—and without it the reaction stops.

So what happens if the reaction inside a power plant starts to run out of control? If that happens, so much energy is released that the reactor overheats and may even explode—but in a relatively small, entirely ***conventional*** explosion, not an apocalyptic nuclear bomb. In that situation, the moderator burns or melts, the reactor is destroyed, and the nuclear reaction stops; there is no runaway chain reaction. The worst situation is called a **meltdown**: the reactor melts into a liquid, producing a hot, radioactive glob that drops deep down into the ground, potentially contaminating water supplies.

There are various other important differences that stop nuclear power plants from turning into nuclear bombs. In particular, nuclear bombs have to be assembled in a very precise way and detonated so that they implode (pushing the nuclear material together so it reacts properly). These conditions don't occur in a nuclear power plant.

A different kind of power plant called a **fast-breeder reactor** works a different way, producing its own plutonium fuel in a self-sustaining process. Its chain reaction is much closer to what happens in a nuclear bomb and it doesn't work through a moderator. That's why a fast-breeder reactor could, theoretically, run out of control and cause a nuclear explosion.

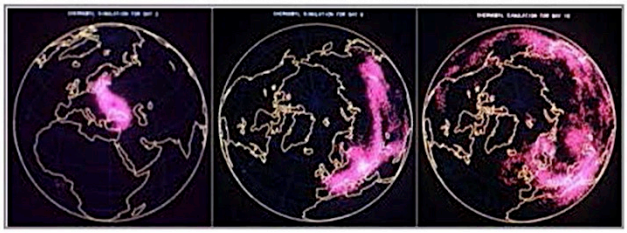


Photo: Nuclear nightmare: In the days following the Chernobyl nuclear power explosion in the Ukraine in 1986, a cloud of radioactive "fallout" spread throughout Europe. In this sequence of pictures, you can see the cloud (the pink area) on day 2, day 6, and day 10 after the accident. It's important to note that what happened here was a conventional explosion that threw radioactive material high into the air: it wasn't anything like a nuclear bomb. Pictures by Lawrence Livermore National Laboratory courtesy of US Department of Energy.

Nuclear power—good or bad?

There are plenty of people who support our use of nuclear power, and at least as many who oppose it. Supporters say it's a less environmentally destructive way of producing electrical energy because, overall, it releases fewer greenhouse emissions (less carbon dioxide gas) than burning fuels such as coal, oil, and natural gas. But opponents are concerned about the dangerous, long-lasting waste that nuclear power stations make, the way nuclear-energy byproducts help people build nuclear bombs, and the risk of catastrophic nuclear accidents.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences



Find out more

On this website

You might like these other articles on our site covering related topics:

- Energy (general introduction)
- Nuclear fusion
- Power plants
- Renewable energy

Other websites

- Nuclear power stations and reactors operational around the world: listed and mapped: Where are all the world's nuclear power plants? What type of reactor do they use? When were they first opened? This March 2011 article from The Guardian presents a list of all the world's (non-scientific) reactors and plots them on a Google Map.
- Nuclear Reactors and Nuclear Bombs: What Defines the Differences?: PBS Newshour, April 6, 2011. Explains the differences in the uranium fuel used by reactors and bombs.
- Nuclear Reactors, the China Syndrome, and Waste Storage by Richard Muller. This is a brief online introduction to nuclear energy—effectively a shortened version of the ideas covered in Richard's book "Physics for Future Presidents," listed below. (Archived link via the Wayback Machine.)
- Hyperphysics: Nuclear: A series of good, short introductions to nuclear physics and its various applications.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Nuclear Power Safety

Pre-reading questions:

1. Before you read the text on nuclear energy as an energy source, take a moment and consider what you might know already about the dangers and safety precautions related to nuclear power plants. Can a nuclear plant explode like a nuclear bomb?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. What are the differences between how nuclear power plant works and how a conventional fossil fuel power plant works?

4. Explain why a nuclear power plant cannot explode like a nuclear bomb.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. List some of the arguments the nuclear power supporters make to encourage its use and some of the arguments opponents make to discourage its use.

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

Benefits and Costs of Energy Choices: Oil

PowerPoint

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

- Students will consider how human use of natural resources for energy affects the biosphere.
- Students will compare the benefits and costs of energy source choices.
- Students will read and analyze visual and print information in diverse texts.
- Students will identify and distinguish conflicting claims about energy source impacts.
- Students will cite specific textual evidence to support analysis of science tests.

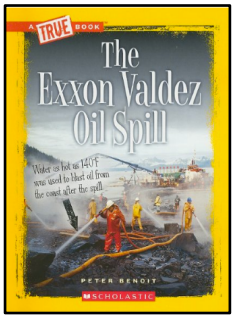
Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.A
	ESS3.C
C3 Framework Social Studies Dimension 2 Concepts	D2.Eco.2.6-8
	D2.Geo.4.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.7
	CCSS.ELA-LITERACY.WHST.6-8.1.A
	CCSS.ELA-LITERACY.RST.6-8.1

Vocabulary:
oil spill, export

Media Type(s): report cover, book cover



U.S. Crude Oil Exports. Report:
American Petroleum Institute, 2015



Benoit, Peter.
The EXXON Valdez Oil Spill
Scholastic, 2011

Preparation and Materials:
*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use These Materials* section.

Preparation:
- Download and review the *How to Use These Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: Use of Oil*
- Two-page *Student Worksheet: Use of Oil*
- Three-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Sustainability: Upper Elementary – Unit 2: Natural Resources, Lesson 1

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Sustainability: Food, Water & Agriculture, Lesson 14, BP Oil & fisheries
Media Constructions of Resource Depletion, Lesson 3, Chukchi Sea Oil Drilling
Media Constructions of Resource Depletion, Lesson 4, Exxon Valdez, Oil & Water

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- What natural resource is depicted in this media example?
- Is this energy source renewable or nonrenewable?
- How does oil drilling impact the biosphere?

Social Studies

- What are the benefits and costs of the energy source represented in this media example?
- How do the decisions to use this energy source influence the local and global environment?

ELA

- What messages are suggested by the visual image and what messages by the text?
- What evidence do you see in the document to support your analysis of the message?
- How do the claims about the energy source differ in each media example?

Media Literacy

- Who might benefit from this message and who might be harmed by it?
- What points of view about energy and technology are implied by this media document?
- What is left out of this message that might be important to know?
- What would you need to know to assess the credibility of these media documents?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?

Writing Prompt for Synthesis Assessment in the Sub-Topic, *Energy Choices*

Summarize the costs and benefits of selected energy choices. Take a position about which source or sources best meet the needs of your community and why.

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested by the visual image and what messages by the text? How do the claims about the energy source differ in each media example? What evidence do you see in the document to support your analysis of the message?

Possible Answer: Doc 1: Image – Oil is a clean and abundant energy source.
Text – Oil exports help both the overall economy and all consumers.
Evidence: Image - The oil tanker is huge, filled with oil, and pristine
Text – *U.S. Crude Oil Exports: Benefits for America's Economy and Consumers*
Possible Answer: Doc 2: Image – Oil spills destroy the environment.
Text – Scalding water kills remaining life in the cleanup after an oil spill.
Evidence: Image – Men in protective gear stand on black rocks covered in oil near coastline fishery.
Text – *Water as hot as 140F was used to blast oil from the coast after the spill*

Media Literacy

Question: Who might benefit from this message and who might be harmed by it?

Possible Answers: Doc #1 might benefit the American Petroleum Institute and the oil industry they represent by encouraging support for US oil exports as clean and economical.
Doc 1 might harm those who argue against fossil fuel production by making oil seem like a clean, affordable and abundant energy source.
Doc 2 might benefit people seeking damages from the Exxon Valdez oil spill and those working against Arctic oil drilling by presenting the real dangers and consequences of oil spills.
Doc 2 might harm Exxon and the oil industry in general by naming the company and industry that caused an environmental catastrophe in Prince William Sound, Alaska.

Question: What is left out of this message that might be important to know?

Possible Answers: Doc 1 leaves unanswered the questions about oil tanker safety, mitigation plans for spills and the impact of oil drilling and transport on natural environments.
Doc 2 doesn't address the overall impact of the Exxon Valdez spill. How much damage did it do to marine environments? Have fish and wildlife populations recovered? Who paid for the cleanup?

Question: What would you need to know to assess the credibility of these media documents?

Possible Answers: **Doc 1**: What sources does it give to support its conclusions? What did critics of this report have to say?
Doc 2: Was this a staged photograph? How do they know the water was 140F? How did Exxon respond to this book? How about responses from environmental organizations in the area of the spill?

OILPRICE.com
The No. 1 Source for Oil & Energy News

Stock Market Crash 2016

Stock Market's "Day of Reckoning" is Fast-Approaching. Shocking
thesovereigninvestor.com

HOME | ENERGY | METALS | ALT. ENERGY | ENVIRONMENT | GEOPOLITICS | FINANCE | TRADING | WIDGETS | NEWS | INTERVIEWS | COMPANY NEWS | Log In | Sign Up

Advertising | Contact Us | About | Authors | Contributors | Write for Us | A A A | Search OilPrice.com | SEARCH

Home | The Environment | Oil Spills | Oil Spills: The Science Behind Cleanups!

Oil Spills: The Science Behind Cleanups!

Insider Secrets

FACEBOOK | LINKEDIN | TWITTER | GOOGLE+ | REDDIT | STUMBLEUPON

By Editorial Dept
Posted on Thu, 15 October 2009 19:47 | 0

As long as we continue to enjoy the vast benefits brought to our lives by our consistent utilization of oil, we will constantly be at periodic risk of experiencing the occasional, accidental oil spill.

All oil spills are bad, but logically those occurring near the coastline are potentially far more devastating, simply because of the vast animal and plant life placed in eminent danger! Coastal areas are home to far more concentrated and diversified populations of marine and land life than is found in the greater depths of the sea.

However, if not properly dealt with immediately, even spills out in the deepest parts of the ocean can, over time, impact "all" marine as well as coastal life as tides, the wind, currents and other environmental circumstances spread the contamination all the way to distant shores.

Crude oil spills can harm wildlife in three very distinct ways:

(1) Poisoning By Ingestion. Many animals that instinctively "preen" themselves in an effort to clean away the contaminant will ingest the oil and become ill, usually dying from the poisoning. Fish and other living creatures and organisms that live in the water are poisoned as the soak in the oil that has sullied their natural living environment.

(2) Negative Health Effects From Direct Contact. The oil gets all over their bodies, coating them in a nasty "slick" that can cause cases of suffocation or inability to cool down and they die from heat stroke. Creatures encrusted with bulky coats of oil are now unable to effectively escape their prey or chase down food, so the entire food chain is knocked out of whack. Many animals will simply die from the toxic fumes or poison seeping into their bloodstream by osmosis through their skin.

(3) Destruction Of Natural Wildlife Habitats. On land, there is suddenly no fresh, drinkable water and plants that once supplied numerous animals with food are now unable to grow and produce nourishment. Fields and forests are depleted, wiping out the homes of numerous species and destroying all protection from the elements, from extreme heat to bone chilling cold.

ABOUT THE AUTHOR

Editorial Dept
full bio
More articles from Editorial Dept

OILPRICE PREMIUM
Inside Investor
Inside Opportunities
Executive Reports
Inside Intelligence
Inside Markets
Why Energy Investors Need Premium

IN OILPRICE PREMIUM



Hold Out On Those Long Term Stock Picks



4 Stages to a Heart Attack



OILPRICE.com FREE Weekly INTELLIGENCE REPORT

Join over 55,000 readers of OilPrice.com's weekly *Intelligence Report*.

Get profitable Stocks & Intel that no one else has... From our 400 Global Assets...
And long before it becomes widely known.

Enter email address

Commodity Prices

	PRICE	CHG	CHG%
WTI Crude	45.13	-0.79	-1.72%
Brent Crude	46.27	-1.10	-2.32%
Ethanol	1.507	-0.038	-2.46%
Natural Gas	2.095	-0.083	-3.81%
Gasoline	1.5698	-0.0346	-2.16%
Heating Oil	1.3692	-0.0168	-1.21%
Gold	1297.2	+6.7	+0.52%

Click on for detailed price charts.

In the water, Spawning grounds are utterly polluted and everything once alive and a part of the natural cycle of life is suddenly diseased, dying or dead. Like knocking over the first of a long string of dominoes, the entire chain of life collapses in upon itself.

So what are our options for cleaning this terribly unfortunate mess up/ There are four standard choices we have available to us, depending on the type of oil spilt, the location and weather conditions involved.

(A)Leave It To Nature: If there are no serious concerns about the local wildlife and environmental concems, there is the option of simply leaving the oil alone and allowing it to naturally break down by itself. As long as there is no discernable risk of potentially polluting coastal regions or marine life, it is often considered most effective and economical to simply allow nature to take its course.

The ocean is nature's most effective cleanser and purifier. As long as there are no great and immediate dangers deemed at risk, the combination waves, currents, tides, wind, sun, salt and sand will effectively disperse and evaporate most oils

(B) Booms & Skimmers: If there are specific environmental risks that are considered serious, or there is reason to believe that a high percentage of the oil can be effectively contained, controlled and recovered, then buoyant "booms" can be utilized to surround and contain the oil from dispersion while it is being collected. Some "booms" are made of an inflatable neoprene tubing filled with air while others are made of various solid materials that float.

They can then use "skimming" equipment to collect the oil from the oils surface, since oil will initially float on the surface of the water for a period of time until it begins to break down by the natural effects of the waves, sun, salt and currents. Various types of booms are used to both "surround and isolate the oil slick" or to effectively blockade the oil from passing through and contaminating specifically targeted areas such as spawning grounds, desalination plants, or other environmentally sensitive areas.

Mearwhile, once the "skimmers" are activated, they effectively float across the top of the oil slick contained within the boom and either suck or scoop the oil into storage tanks held on nearby vessels or on the shore. As long as the waves and the winds don't pick too much intensity, this is a highly effective method of slick cleansing and recovery.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

(C) Usage Of Chemical Dispersants: Sometimes there simply is no way to recover the oil in time before the ocean currents and winds begin to spread the contamination well beyond the original spill zone. In this case, "dispersants" are used to help break up and break down the oil and quicken the process of its natural biodegradation.

These dispersants work by reducing "surface tension" that normally stops the proverbial "oil and water" from being able to mix. This creates small, minute droplets of oil that are much faster diluted and eventually dissolved by the movement and agitation naturally created by the world's largest "washing machine!"

Such dispersion and dilution of the oil slick automatically increases the area over which the spill is spread, naturally increasing the exposure to water agitation, evaporation and biological effects of organic bacterial interactions, which include breaking the oil down and in some cases, actually feeding off of it.

This methodology is most effective within a few hours of the spill and should be avoided in locations where sub-tidal seafood, marine organisms, coral reefs and sea grasses are in abundance, as this dissipation process can poison these particularly fragile environments.

(D) Biological Agents To The Rescue: We have thankfully now learned highly effective methods of introducing "biological agents" to oil slicks that quite efficaciously break the oil up and allow natural processes of biodegradation to do their work much faster than would occur if nature, unassisted by man, were simply allowed to do it's own housework.

This "bio-chemically" alters the components of oil spill in such a way as to be a lot more easily and quickly broken down by bacteria and other natural microorganisms into a safe and harmless substance made up of simple fatty acids and carbon dioxide.

This is by far the most natural yet effectively active form of biodegradation. This natural process will additionally be sped up by adding certain helpful fertilizing nutrients, such as phosphorous and nitrogen, which automatically stimulate the rapid and effective growth of the micro-organisms that will bust up the oil or simple eat it up like a fine, gourmet meal.

Written for OilPrice.com - the no.1 source for oil prices.

More About Us	Energy	Metals	Alternative Energy	Site Info
About Us	Oil Prices	Gold	Nuclear Power	Terms & Conditions
Site News	Crude Oil	Silver	Solar Energy	Disclaimer
Sitemap	Gas Prices	Commodities	Hydroelectric	Privacy Policy
Advertise with us	Heating Oil	Platinum	Renewable Energy	Sitemap

OILPRICE is a CNBC Partner Site.

© 2016 OilPrice.com | OilPrice.com is a CNBC Partner Site | Google+

The materials provided on this Web site are for informational and educational purposes only and are not intended to provide tax, legal, or investment advice. Nothing contained on the Web site shall be considered a recommendation, solicitation, or offer to buy or sell a security to any person in any jurisdiction.

Merchant of Record: A Media Solutions trading as Oilprice.com

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Oil Spill Cleanups

Pre-reading questions:

1. Before you read the text on the uses of oil, take a moment and consider what you might know already about the topic. For example, what are some of the effects of oil spills on the coastal environment??

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. According to the authors why are coastal oil spills more devastating than those in the open ocean?

4. Name three ways that oil spills can harm wildlife.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What are some of the options for cleaning the environment following an oil spill?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. There are no references for this reading. How does the lack of references affect your rating of the credibility of the overall web page?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

Solar: Benefits and Costs

PPT
PowerPoint

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

- Students will consider how human use of natural resources for energy affects the biosphere.
- Students will compare the benefits and costs of energy source choices.
- Students will read and analyze visual and print information in diverse texts.
- Students will identify and distinguish conflicting claims about energy source impacts.
- Students will cite specific textual evidence to support analysis of science texts.

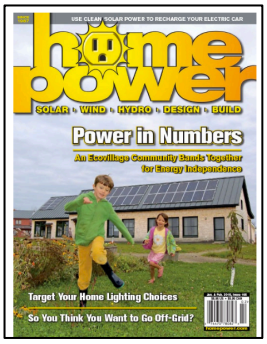
Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.A
	ESS3.C
C3 Framework Social Studies Dimension 2 Concepts	D2.Eco.2.6-8
	D2.Geo.4.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.7
	CCSS.ELA-LITERACY.WHST.6-8.1.A
	CCSS.ELA-LITERACY.RST.6-8.1

Vocabulary:
solar power, solar plant, desert tortoise, ecovillage, off-grid

Media Type(s): web page, magazine cover



Where Tortoises and Solar Power Don't Mix Web page: Bloomburg Business, 2012



Power in Numbers. Magazine cover: Home Power, 2015

Preparation and Materials:

*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use Materials* section.

Preparation:
- Download and review the *How to Use Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: The Solar Resource*
- Two-page *Student Worksheet: The Solar Resource*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Sustainability: Upper Elementary – Unit 2: Natural Resources, Lesson 1

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Sustainability: Middle School – Energy Sources: Comparing Renewables
Media Constructions of Global Warming: Lesson 7, Activity 3, Solar Energy International advertisement

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- What natural resource is depicted in this media example?
- Is this energy source renewable or nonrenewable?
- How does solar power impact the biosphere?

Social Studies

- What are the benefits and costs of the energy source represented in this media example?
- How do the decisions to use this energy source influence the local and global environment?

ELA

- What messages are suggested by the visual image and what messages by the text?
- What evidence do you see in the document to support your analysis of the message?
- How do the claims about the energy source differ in each media example?

Media Literacy

- Who might benefit from this message and who might be harmed by it?
- What points of view about energy and technology are implied by this media document?
- What is left out of this message that might be important to know?
- What would you need to know to assess the credibility of these media documents?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?

Writing Prompt for synthesis assessment in the sub-topic, *Energy Choices*

Summarize the costs and benefits of selected energy choices. Take a position about which source or sources best meet the needs of your community and why.

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested by the visual image and what messages by the text? How do the claims about the energy source differ in each media example? What evidence do you see in the document to support your analysis of the message?

Possible Answer: Doc 1: Image – Tortoises and solar panels cannot coexist.
Text – Large solar arrays require expensive removal of local species.
Evidence: Image – The desert tortoise is trampling the solar panels.
Text – *$56 million spent…to relocate desert tortoises from the… construction of a Mojave Desert solar plant.*
Possible Answer: Doc 2: Image – Children enjoy living in a solar home.
Text – Communities working together benefit from investments in solar power.
Evidence: Image – The children are playing and smiling beneath the rooftop solar panels.
Text – *Power in Numbers; Community bands together for energy independence*

Media Literacy

Question: Who might benefit from this message and who might be harmed by it?

Possible Answers: Doc 1 might benefit desert tortoises and people who are working to protect them.
Doc 1 might harm the Mojave Desert solar plant and the solar industry in general by urging people to consider the negative environmental impacts of large-scale solar arrays.
Doc 2 might benefit the solar industry by encouraging support for solar power as practical and economical for community investment.
Doc 2 might harm those who argue against solar power and other renewables by making solar seem like a economical option for people with young families living in community.

Question: What is left out of this message that might be important to know?

Possible Answers: Doc 1 doesn't address the comparative economic benefits of the energy produced by the Mojave solar plant compared to the amount it will cost to relocate the tortoise. **Doc 2** leaves unanswered the questions about the impact of solar on desert habitats.

Question: What would you need to know to assess the credibility of these media documents?

Possible Answers: **Doc 1**: Are there ways to build desert solar plants that minimize disruption of local habitats? Where did the authors get the figure of $56 million? How does the solar industry respond to these claims?
Doc 2: How many households have to join together to make "energy independence" economically feasible? Was this a candid or a staged photo? Are fossil fuel sources more affordable than the renewable sources referenced beneath the title?

Union of Concerned Scientists
Science for a healthy planet and safer world

SEARCH >

Our Work | About | Take Action | Subscribe Donate

ENERGY > RENEWABLE ENERGY

The Solar Resource

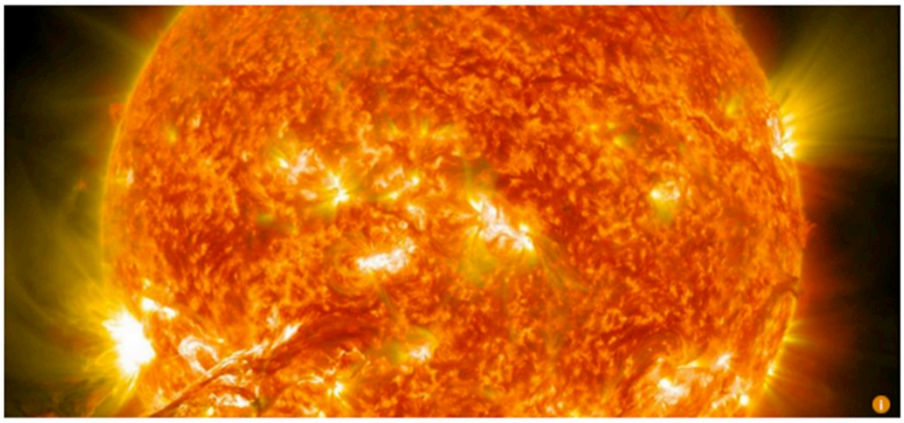
Solar energy—power from the sun—is a vast, inexhaustible, and clean resource

< PREVIOUS: How Solar Energy Works | NEXT: How Solar Panels Work >

Solar electricity generation represents a clean alternative to electricity from fossil fuels, with no air and water pollution, no global warming pollution, no risks of electricity price spikes, and no threats to our public health.

Solar energy can also heat water, cool and heat homes, and provide free, natural lighting. And once a system is in place to convert the solar resource into useful energy, the fuel is free.

The solar resource is enormous



Just 18 days of sunshine on Earth contains the same amount of energy as is stored in *all* of the planet's reserves of coal, oil, and natural gas.

Outside the atmosphere, the sun's energy contains about 1,300 watts per square meter. Once it reaches the atmosphere, about one-third of this light is reflected back into space, while the rest continues toward Earth's surface.

Averaged over the entire surface of the planet, a square meter collects 4.2 kilowatt-hours of energy every day, or the approximate energy equivalent of nearly a barrel of oil per year.

Deserts, with very dry air and little cloud cover, receive the most sun—more than 6 kilowatt-hours per day per square meter on average over the course of the year.

Converting solar energy into electricity



[SHARE]

[RELATED CONTENT]

Solar Power on the Rise: The Technologies and Policies behind a Booming Energy Sector (2014)

Renewable Energy Technologies

[FROM OUR BLOGS]

Ada Lovelace, Women's History, and the Challenge of Science While Parenting
GRETCHEN GOLDMAN | MARCH 28, 2016

U.S. Chamber of Commerce Forecasts No Growth in Renewable Energy. We Disagree.
MIKE JACOBS | MARCH 25, 2016

Will Spring Bring More Sunlight? Freedom of Information on Congressional Agenda
CELIA WEXLER | MARCH 25, 2016

[ON TWITTER]

Concerned Scientists
@UCSUSA
Find out how @TomColicchio & #PlateoftheUnion campaign are trying to reach presidential candidates on food issues bravo.ly/1LuRrII

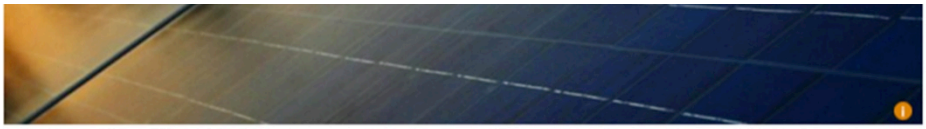


How Tom Colicchio's New Food Truck Coul...
If you're a celebrity chef like Tom Colicchio and...
bravotv.com

Concerned Scientists Retweeted
Future of Life
@FLIxrisk
Join FLI, William Perry, Frank Wilczek and many others to brainstorm how to save the world!
buff.ly/1LN6fSH



Concerned Scientists Retweeted
Seth D. Michaels
@sethdmichaels
space fans, follow @UCSSatDB for lots of fun facts about the satellites we have circling the earth.



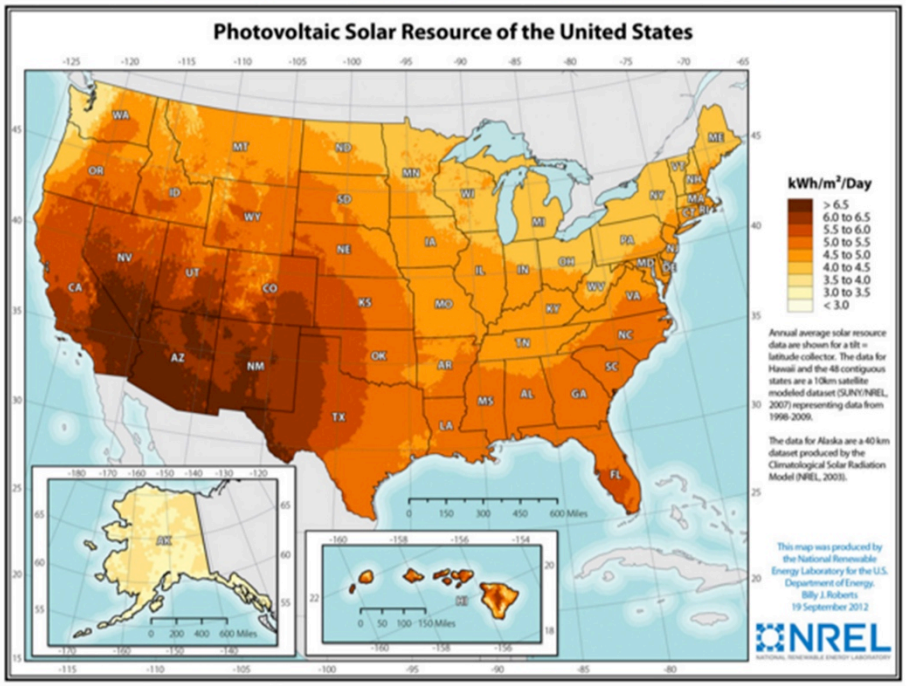
Photovoltaic (PV) panels and concentrating solar power (CSP) facilities capture sunlight and convert it into useful electricity.

Rooftop PV panels make solar power viable in virtually every part of the United States. In a sunny location such as Los Angeles or Phoenix, a five-kilowatt residential system produces an average of 7,000 to 8,000 kilowatt-hours per year, roughly equivalent to the electricity usage of a typical U.S. household.

Solar achieves similar results in many other parts of the country as well. For example, in some northern locations—such as Portland, Maine—that same system generates 85 percent of what it would in Los Angeles on average, and 95 percent of what it would in Miami. (And the system in Maine would actually generate 6 percent *more* electricity than in Houston [1]).

As of mid-2015, almost 800,000 PV systems had been installed on rooftops across the United States [2]. And the potential is far greater, with some 35 million residential and commercial rooftops suitable candidates for PV [3].

Like rooftop panels, large-scale PV projects use photovoltaic panels to convert sunlight into electricity. These projects often have outputs in the range of hundreds of megawatts, which can involve millions of solar panels installed over a large area of land. In addition to scale, outputs can be increased with specialized tracking mechanisms that allow panels to follow the sun and collect light at an optimal angle, greatly increasing the system's efficiency.



Concentrated solar power (CSP), instead of using the sun's light, takes advantage of the sun's heat to produce a heated liquid and steam that drives a turbine. While CSP projects have been installed in various parts of the country, the CSP resource is largely concentrated in the desert regions of the U.S. West and Southwest, where the solar resource is more consistent and concentrated.

In 2014 alone, for example, three large projects went online in the desert environments of California—Mojave Solar One, Ivanpah Solar Electric Generating System, and Genesis Solar—adding a total of 892 MW of solar capacity to the electricity grid, enough power to serve nearly 220,000 average American homes [4].

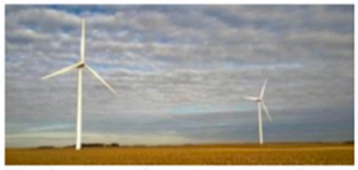
[INFOGRAPHIC]

AFFORDABLE, AVAILABLE ROOFTOP SOLAR



Installing rooftop solar panels has never been more affordable.

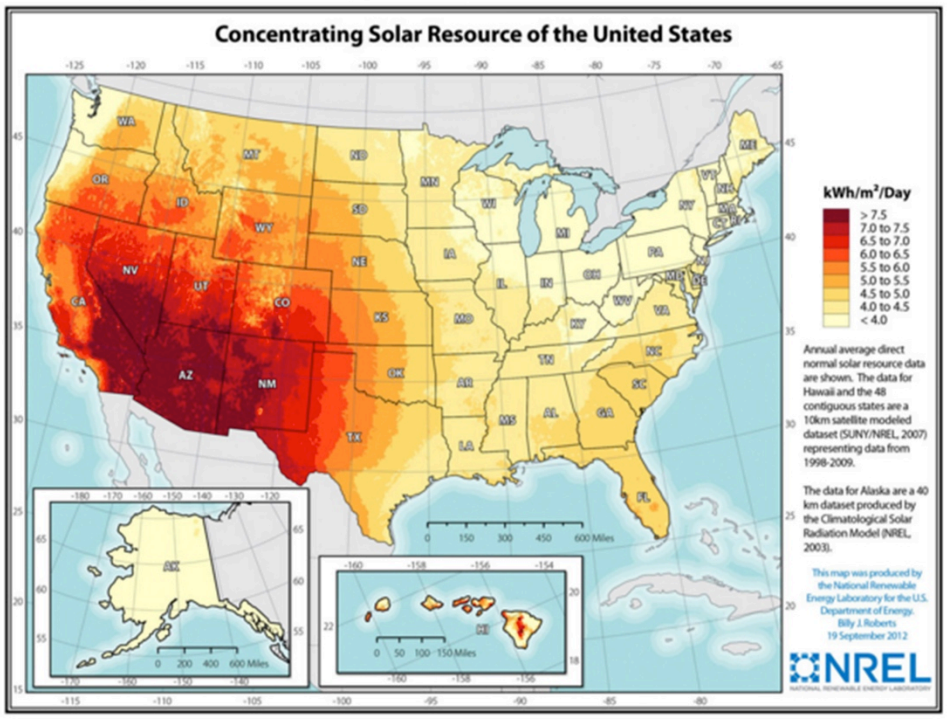
[TAKE ACTION]



The Supreme Court's recent ruling on the Clean Power Plan is a speed bump, not a stop sign. Urge your governor to act now.

Tell your governor to power ahead on the Clean Power Plan. >

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences



Given the abundance of sunshine across the country, solar has the potential to supply a rapidly growing amount of electricity that is environmentally and economically attractive, nationwide.

< PREVIOUS: How Solar Energy Works | NEXT: How Solar Panels Work >

References:

[1] National Renewable Energy Laboratory (NREL). 2014a. PVWatts® calculator. Golden, CO.

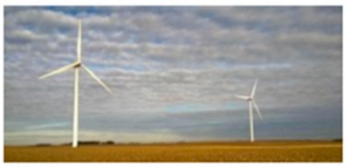
[2] Solar Energy Industries Association (SEIA). 2014d. Solar Industry Data.

[3] Environment America. 2014. Star Power, The Growing Role of Solar Energy in America.

[4] U.S. Department of Energy (DOE). 2014. 2014: The Year of Concentrating Solar Power.

Last Revised: September 16, 2015

[TAKE ACTION]



The Supreme Court's recent ruling on the Clean Power Plan is a speed bump, not a stop sign. Urge your governor to act now.

Tell your governor to power ahead on the Clean Power Plan. >

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- The Solar Resource

Pre reading questions:

1. Before you read the text on solar energy as an energy source, take a moment and consider what you might know already about the potential for widespread use of solar power. In what states might solar power work in the United States?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. Which of these locations might be best for harvesting solar power and why? Ocean, forest, desert or mountain.

4. Describe the differences between these two types of solar energy capture technologies: photovoltaic (PV) panels and concentrated solar power (CSP)

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. Refer to the Map of the Photovoltaic Solar Resource of the United States. How would the data on the map encourage or discourage you from pursuing solar energy in your state? Explain.

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

Wind: Benefits and Costs

PPT
PowerPoint

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

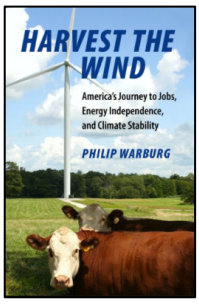
Objective Options:

- Students will consider how human use of natural resources for energy affects the biosphere.
- Students will compare the benefits and costs of energy source choices.
- Students will read and analyze visual and print information in diverse texts.
- Students will identify and distinguish conflicting claims about energy source impacts.
- Students will cite specific textual evidence to support analysis of science texts.

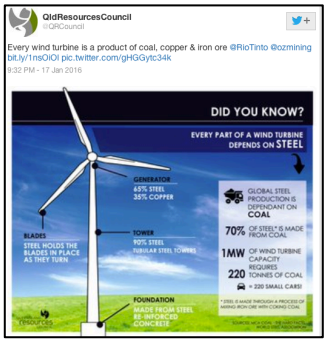
Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.A
	ESS3.C
C3 Framework Social Studies Dimension 2 Concepts	D2.Eco.2.6-8
	D2.Geo.4.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.7
	CCSS.ELA-LITERACY.WHST.6-8.1.A
	CCSS.ELA-LITERACY.RST.6-8.1

Vocabulary:
wind power, turbine, climate stability

Media Type(s): book cover, tweet



Harvest the Wind. Book cover: Beacon Press, 2013



Every Part of a Wind Turbine Depends on Steel. Tweet: Queensland Resources Council, 2016

Preparation and Materials:

*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use Materials* section.

Preparation:
- Download and review the *How to Use Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: How Wind Energy Works*
- Two-page *Student Worksheet: The Future of Wind Power*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Sustainability: Upper Elementary – Unit 2: Natural Resources, Lesson 1

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Sustainability: Middle School – Energy Sources: Comparing Renewables

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- What natural resource is depicted in this media example?
- Is this energy source renewable or nonrenewable?
- How does wind power impact the biosphere?

Social Studies

- What are the benefits and costs of the energy source represented in this media example?
- How do the decisions to use this energy source influence the local and global environment?

ELA

- What messages are suggested by the visual image and what messages by the text?
- What evidence do you see in the document to support your analysis of the message?
- How do the claims about the energy source differ in each media example?

Media Literacy

- Who might benefit from this message and who might be harmed by it?
- What points of view about energy and technology are implied by this media document?
- What is left out of this message that might be important to know?
- What would you need to know to assess the credibility of these media documents?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?

Writing Prompt for synthesis assessment in the sub-topic, *Energy Choices*

Summarize the costs and benefits of selected energy choices. Take a position about which source or sources best meet the needs of your community and why.

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested by the visual image and what messages by the text? How do the claims about the energy source differ in each media example? What evidence do you see in the document to support your analysis of the message?

Possible Answer: Doc 1: Image – Wind is a serene and green energy source.
Text – Wind power helps support the economy and minimizes climate impacts.
Evidence: Image – The cows appear calm beneath the turbine in a green rural setting.
Text – *Journey to Jobs* and *Climate Stability*
Possible Answer: Doc 2: Image – Wind turbine construction requires lots of coal.
Text – Vast mineral extraction is needed to make wind power generation possible.
Evidence: Image – The turbine blade points to a dump truck loaded with coal.
Text – *Turbine depends on steel; Turbine is a product of coal, copper & iron ore.*

Media Literacy

Question: Who might benefit from this message and who might be harmed by it?

Possible Answers: Doc #1 might benefit the wind power industry and its supporters by encouraging support for wind power as clean and good for the economy.
Doc 1 might harm those who argue against wind energy by making wind seem like a green energy source that provides jobs and supports local energy production.
Doc 2 might benefit people opposing wind power projects by exposing the mineral and fossil fuel sources needed to build wind power infrastructure.
Doc 2 might harm the wind power industry and the renewable energy industry in general by naming the reality of "green" energy's dependence on an economy rooted in natural resource extraction.

Question: What is left out of this message that might be important to know?

Possible Answers: Doc 1 leaves unanswered the questions about the reliance of wind power on mining coal, copper and iron ore.
Doc 2 doesn't address the relative costs over time of wind power production vs. fossil fuels production which requires a continuous extraction and burning of natural resources.

Question: What would you need to know to assess the credibility of these media documents?

Possible Answers: **Doc 1**: What sources does it give to support its conclusions? What did critics of this book have to say?
Doc 2: Does the Queensland Resources Council propose an alternative energy source that relies less on mining than does wind power? What are the responses from environmental organizations to these concerns?

ENERGY > RENEWABLE ENERGY

How Wind Energy Works

Contents

- The History of Wind Power >
- The Wind Resource >
- Addressing the Variability of Wind Power >
- The Mechanics of Wind Turbines >
- The Market for Wind >
- The Future of Wind Power >



Harnessing the wind is one of the cleanest, most sustainable ways to generate electricity. Wind power produces no toxic emissions and none of the heat-trapping emissions that contribute to global warming. This, and the fact that wind power is one of the most abundant and increasingly cost-competitive energy resources, makes it a viable alternative to the fossil fuels that harm our health and threaten the environment.

Wind energy is the fastest growing source of electricity in the world. In 2012, nearly 45,000 megawatts (MW) of new capacity were installed worldwide. This stands as a 10 percent increase in annual additions compared with 2011 [1].

The United States installed a record 13,351 MW of wind power in 2012, capable of producing enough electricity to power more than 3 million typical homes [2]. While wind energy accounted for just under four percent of U.S. electricity generation in 2012, it already generates more than 10 percent of the electricity in nine U.S. states [3]. Thanks to its many benefits and significantly reduced costs, wind power is poised to play a major role as we move toward a sustainable energy future.

The Mechanics of Wind Turbines

Modern electric wind turbines come in a few different styles and many different sizes, depending on their use. The most common style, large or small, is the "horizontal axis design" (with the axis of the blades horizontal to the ground). On this turbine, two or three blades spin upwind of the tower that it sits on.

Small wind turbines are generally used for providing power off the grid, ranging from very small, 250-watt turbines designed for charging up batteries on a sailboat, to 50-kilowatt turbines that power dairy farms and remote villages. Like old farm windmills, these small wind turbines often have tail fans that keep them oriented into the wind.

[SHARE]

[RELATED CONTENT]
Renewables: Tapping Into Wind Power
Benefits of Renewable Energy Use
Ramping Up Renewables: U.S. Can Significantly Increase Renewable Energy Sources (2013)
Environmental Impacts of Wind Power

[FROM OUR BLOGS]
Ada Lovelace, Women's History, and the Challenge of Science While Parenting
GRETCHEN GOLDMAN | MARCH 28, 2016
U.S. Chamber of Commerce Forecasts No Growth in Renewable Energy. We Disagree.
MIKE JACOBS | MARCH 25, 2016
Will Spring Bring More Sunlight? Freedom of Information on Congressional Agenda
CELIA WEXLER | MARCH 25, 2016

[ON TWITTER]
Concerned Scientists
@UCSUSA
Find out how @TomColicchio & #PlateoftheUnion campaign are trying to reach presidential candidates on food issues bravo.ly/1LuRrII



How Tom Colicchio's New Food Truck Coul...
If you're a celebrity chef like Tom Colicchio and...

[TAKE ACTION]

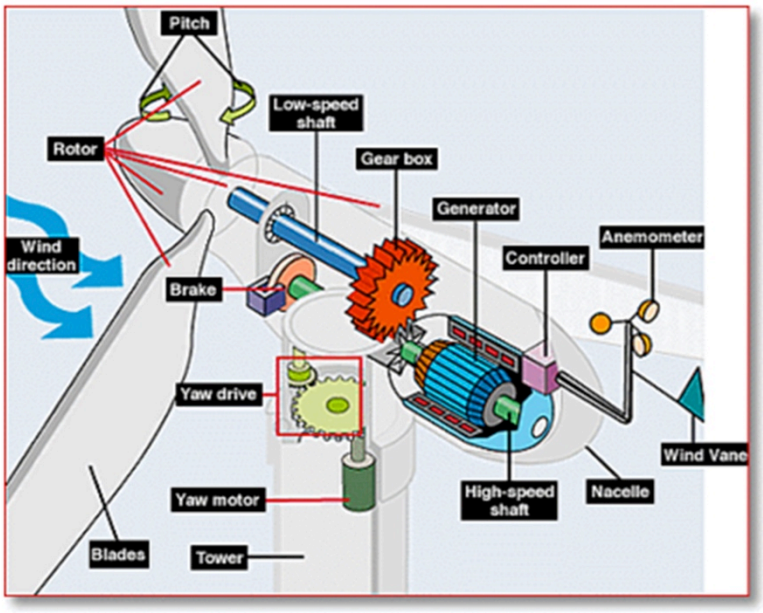


The Supreme Court's recent ruling on the Clean Power Plan is a speed bump, not a stop sign. Urge your governor to act now.

Tell your governor to power ahead on the Clean Power Plan. >

Large wind turbines, most often used by utilities to provide power to a grid, range from 250 kilowatts up to the enormous 3.5 to 5 MW machines that are being used offshore. In 2009, the average land-based wind turbines had a capacity of 1.75 MW [12]. Utility-scale turbines are usually placed in groups or rows to take advantage of prime windy spots. Wind "farms" like these can consist of a few or hundreds of turbines, providing enough power for tens of thousands of homes.

From the outside, horizontal axis wind turbines consist of three big parts: the tower, the blades, and a box behind the blades, called the nacelle. Inside the nacelle is where most of the action takes place, where motion is turned into electricity. Large turbines don't have tail fans; instead they have hydraulic controls that orient the blades into the wind.



Source: National Renewable Energy Laboratory (NREL)

In the most typical design, the blades are attached to an axle that runs into a gearbox. The gearbox, or transmission, steps up the speed of the rotation, from about 50 rpm up to 1,800 rpm. The faster spinning shaft spins inside the generator, producing AC electricity. Electricity must be produced at just the right frequency and voltage to be compatible with a utility grid. Since the wind speed varies, the speed of the generator could vary, producing fluctuations in the electricity. One solution to this problem is to have constant speed turbines, where the blades adjust, by turning slightly to the side, to slow down when wind speeds gust. Another solution is to use variable-speed turbines, where the blades and generator change speeds with the wind, and sophisticated power controls fix the fluctuations of the electrical output. A third approach is to use low-speed generators. Germany's Enercon turbines have a direct drive that skips the step-up gearbox.

An advantage that variable-speed turbines have over constant-speed turbines is that they can operate in a wider range of wind speeds. All turbines have upper and lower limits to the wind speed they can handle: if the wind is too slow, there's not enough power to turn the blades; if it's too fast, there's the danger of damage to the equipment. The "cut in" and "cut out" speeds of turbines can affect the amount of time the turbines operate and thus their power output.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

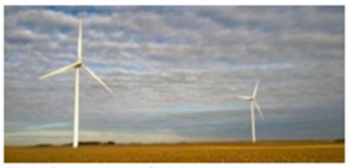
The Future of Wind Power

With increasingly competitive prices, growing environmental concerns, and the call to reduce dependence on foreign energy sources, a strong future for wind power seems certain. The Global Wind Energy Council projects global wind capacity will reach 536,000 MW by 2017, almost double its current size, with growth especially concentrated in the Asia and Europe [23]. Turbines are getting larger and more sophisticated, with land-based turbines now commonly in the 1-2 MW range, and offshore turbines in the 3-5 MW range. The next frontiers for the wind industry are deep-water offshore and land-based systems capable of operating at lower wind speeds. Both technological advances will provide large areas for new development.

As with any industry that experiences rapid growth, there will be occasional challenges along the way. Like much of the U.S. economy, the financial crisis has taken a heavy toll on the wind industry, slowing down the financing of new projects and stymieing progress of the growing U.S. wind manufacturing industry. There are also concerns about collisions with bird and bat species in a few locations. And the not-in-my-backyard (NIMBY) issue continues to slow development in some regions. But new manufacturing facilities, careful siting and management practices, and increased public understanding of the significant and diverse benefits of wind energy will help overcome these obstacles. (See also: Environmental Impacts of Wind Power.)

A 2008 comprehensive study by the U.S. Department of Energy found that expanding wind power to 20 percent by 2030 is feasible, affordable, and would not affect the reliability of the nation's power supply. Besides showing that it could be done, it estimated that achieving this goal would create over 500,000 new U.S. jobs, reduce global warming emissions by 825 million metric tons per year (about 20 percent), and save 4 trillion gallons of water [24]. Added to this list of benefits would be greatly improved air and water quality for future generations and much less vulnerability to fluctuations in fossil fuel prices. While getting to that level will require a determined national effort, wind energy is more than ready to meet the challenge.

[TAKE ACTION]



The Supreme Court's recent ruling on the Clean Power Plan is a speed bump, not a stop sign. Urge your governor to act now.

Tell your governor to power ahead on the Clean Power Plan. >

References:

[1] Global Wind Energy Council (GWEC). Global Wind Report 2012.

[2] American Wind Energy Association (AWEA). 2013. Wind energy top source for new generation in 2012; American wind power installed new record of 13,124 MW.

[3] American Wind Energy Association (AWEA). 2013. American wind power now generates over 10 percent of electricity in nine states.

[12] American Wind Energy Association (AWEA). Anatomy of a Wind Turbine.

[23] Global Wind Energy Council (GWEC). Global Wind Report 2012.

[24] O'Connell, R., R. Pletka, S. Block, R. Jacobson, P. Smith, S. Tilley, and A. York. 2007. 20 percent wind energy penetration in the United States: A technical analysis of the energy resource. Overland Park, KS: Black & Veatch.

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- The Future of Wind Power

Pre-reading questions:

1. Before you read the text on the future of wind as an energy source, take a moment and consider what you might know already about the pros and cons. What are some of the benefits and challenges of using wind power?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. List three challenges that the wind power industry faces in its effort to be economically feasible and accepted by the public as a reliable and safe power source.

4. List four benefits of moving to wind power as a primary energy source according to the authors.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. Explain three possible solutions to the problem of variable wind speed which can cause fluctuations in electricity production.

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

PPT
PowerPoint

Comparing Renewables: U.S. vs. Global Energy Use

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

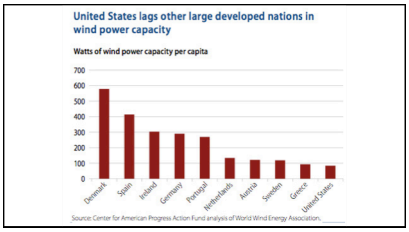
- Students will consider how the use of renewable energy sources can help to reduce human vulnerability to climate change.
- Students will reflect on the impact of economic decisions on the global climate.
- Students will cite textual evidence to support analysis of text and graphs on energy use.
- Students will identify and distinguish techniques in graph construction to convey different messages about the use of renewable energy sources.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.A
	ESS3.D
C3 Framework Social Studies Dimension 2 Concepts	D2.Eco.1.6-8
	D2.Geo.4.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RST.6-8.1
	CCSS.ELA-LITERACY.RST.6-8.4
	CCSS.ELA-LITERACY.RST.6-8.7

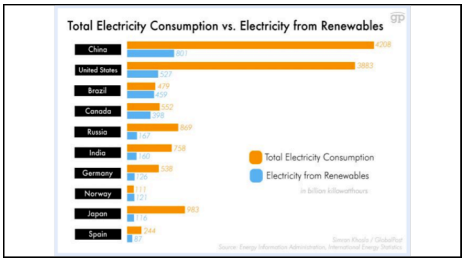
Vocabulary:

Wind power, watt, per capita capacity, electricity consumption renewable resources

Media Type(s): web page graphs



United States Lags
Web page graph: Center For American Progress, 2016



Total Electricity Consumption
Web page graph: Compare Electricity, 2016

Preparation and Materials:

*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use Materials* section.

Preparation:
- Download and review the *How to Use Materials* section associated with this kit.

Materials for the Lesson:
- Two-page *Student Handout: Renewable Energy Explained*
- Two-page *Student Worksheet: Renewable Energy*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Sustainability: Upper Elementary – Unit 2: Natural Resources, Lesson 5

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Sustainability: Middle School – Energy Sources: Wind
Media Constructions of Sustainability: Middle School – Energy Sources: Solar
Media Constructions of Global Warming: Lesson 7, Activity 3, Solar Energy International advertisement
Media Constructions of Sustainability: Food, Water & Agriculture – Lesson 8: Sustainable Economics
Media Constructions of Sustainability: Food, Water & Agriculture – Lesson 18: Biofuels

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- Which countries are doing the most to shift to renewable energy production?
- How do engineering capabilities help reduce human vulnerability to climate change?

Social Studies

- How does the U.S. fare in renewable energy development compared to other nations?
- Which countries have advanced farthest in developing renewable energy sources to reduce carbon emissions?
- How do the national economic decisions shown in the charts impact the environment?

ELA

- What messages are suggested by the graph related to renewable energy development?
- What evidence do you see in the document to support your analysis of the message?
- What do these terms mean? "capacity per capita" and "total electricity consumption"

Media Literacy

- What choices did the graph designers make to have the U.S. appear at the bottom scale of the one graph and near the top of the other?
- What choices could the doc #1 graph designer have made to reverse the U.S. scale positions on the graph?
- Which graph is most critical of U.S. renewable energy development and why do you think that?
- What information is left out of these graphs that might be important to know?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?

Writing Prompt for assessment in the sub-topic, *Comparing Renewables*

Draw evidence from the handout and the graphs to support to or to oppose this statement:
"The United States is making good progress in developing renewable energy sources."

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested by the graph related to renewable energy development? What evidence do you see in the document to support your analysis of the message?
Possible Answer: Doc 1: The United States has done little to develop wind energy resources compared to other western countries.
Evidence: Text: *U.S. lags other large developed nations in wind power capacity.*
Graph: U.S. has the lowest bar in the array.
Possible Answer: Doc 2: The United States is second only to China in renewable energy.
Evidence: Graph: U.S. has the second longest blue bar (renewables) bar in the array.

Question: What do these terms mean?
capacity per capita – national wind power capacity per person or the total national wind power resources divided by the number of people in the country
total electricity consumption – measure of the total national use of electrical power

Media Literacy

Question: What choices did the graph designers make to have the U.S. appear at the bottom scale of the one graph and near the top of the other?
Possible Answers: Doc 1 designer chose for comparison countries that had more per capita wind power than the U.S. **Doc 2** designer chose to base the graph on total electricity consumption rather than per capita consumption.

Question: What choices could the doc #1 graph designer have made to reverse the U.S. scale positions on the graph?
Possible Answers: Doc 1 designer could have chosen to base the graph on total wind power capacity rather than per capita since, as a large country, the U.S. totals would surpass many smaller countries in total wind power capacity.

Question: Which graph is most critical of U.S. renewable energy development and why do you think that?
Possible Answers: Doc 1 is more critical showing the U.S. far behind other developed countries in wind power capacity per capita while Doc 2, at a quick reading not taking into account country size, could suggest that the U.S. is doing well in renewable energy development compared to most other countries.

Question: What information is left out of these graphs that might be important to know?
Possible Answers: The graphs are not dated so we can't know if the data and the relative country positions have changed since their construction. Though we have a reference to the source of information for each we do not have the documents in which these graphs were placed that could give other helpful context to the messages in the graphs.

eia Independent Statistics & Analysis
U.S. Energy Information Administration

Sources & Uses | Topics | Geography | Tools | Learn About Energy | News | A-Z Index

Home > Energy Explained > Renewable Sources

Energy Explained — Home

- What Is Energy?
- Units and Calculators
- U.S. Energy Facts
- Use of Energy
- Energy and the Environment
- **Nonrenewable Sources**
  - Oil and Petroleum Products
    - Gasoline
    - Diesel Fuel
    - Heating Oil
    - Propane
  - Natural Gas
  - Coal
  - Nuclear
- **Renewable Sources**
  - Hydropower
  - Biomass
  - Biofuels: Ethanol & Biodiesel
  - Wind
  - Geothermal
  - Solar
- **Secondary Sources**
  - Electricity
  - Hydrogen

eia TODAY IN ENERGY Energy analysis every weekday

Outreach Toolkit Help Promote Energy Literacy

Renewable Energy *Explained*

Basics | Types & Usage | Incentives | Portfolio Standards

Print | Email | Bookmark & Share

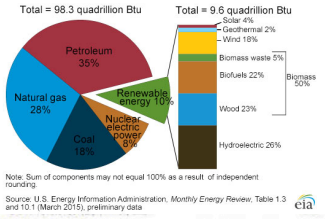
What is renewable energy?

Unlike fossil fuels, which are finite, renewable energy sources regenerate.

There are five commonly used renewable energy sources:

- Biomass—includes:
  - Wood and wood waste
  - Municipal solid waste
  - Landfill gas and biogas
  - Ethanol
  - Biodiesel
- Hydropower
- Geothermal
- Wind
- Solar

U.S. energy consumption by energy source, 2014



Note: Sum of components may not equal 100% as a result of independent rounding.
Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3 and 10.1 (March 2015), preliminary data

Click to enlarge »

What role does renewable energy play in the United States?

More than 150 years ago, wood supplied nearly 90% of the nation's energy needs. As the use of coal, petroleum, and natural gas expanded, the United States became less reliant on wood as an energy source. Today, using renewable energy sources like wood to meet the nation's energy needs is becoming more popular.

In 2014, consumption of renewable energy sources in the United States totaled about 9.6 quadrillion British thermal units (Btu)—1 quadrillion is the number 1 followed by 15 zeros—or about 10% of total U.S. energy consumption. About 13% of U.S. electricity was generated from renewable energy sources in 2014.

Many paper mills use wood waste to produce steam and electricity.



Source: Stock photography (copyrighted)

More than half of U.S. renewable energy use is for producing electricity. Biomass (wood and waste) is the second most commonly used renewable energy source. Biomass is used to produce heat and steam for industrial purposes, and it is also used for space heating. Biomass also includes biofuels like ethanol and biodiesel, which are used for transportation.

Renewable energy plays an important role in reducing greenhouse gas emissions. When renewable energy sources are used, the demand for fossil fuels is reduced. Unlike fossil fuels, non-biomass renewable sources of energy (hydropower, geothermal, wind, and solar) do not directly emit greenhouse gases.

The production and use of biofuels and nonhydroelectric renewable energy sources doubled from 2000 to 2014, mainly because of state and federal government mandates and incentives for renewable energy. The use of renewable fuels is expected to continue to grow over the next 25 years. The U.S. Energy Information Administration (EIA) projects that the United States will use nonrenewable fuels to meet most of its energy needs through 2040.

Why don't we use more renewable energy?

In the past, renewable energy has generally been more expensive to produce and use than energy produced using fossil fuels. Renewable resources are often located in remote areas, and it can be expensive to build power lines to the cities where the electricity produced from renewable energy is needed. The use of renewable sources is also limited by the fact that they are not always available—cloudy days reduce electricity generated from solar installations; days without wind reduce electricity from wind farms; and droughts reduce the water available for hydropower.

How do we measure renewable energy?

Each energy source is measured, purchased, and sold in different forms. Many units of measurement are used to measure energy. Learn more about converting energy units in the Energy units and calculators Energy Explained section.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

Also on *Energy Explained*
- Hydropower
- Biomass
- Biofuels: Ethanol and Biodiesel
- Wind
- Solar

FAQs
- How much U.S. energy consumption and electricity generation comes from renewable sources?
- Renewable energy FAQs
- General energy FAQs

Learn more
- Database of State Incentives for Renewables and Efficiency
- Federal and state laws and incentives for alternative fuels and vehicles
- The Green Power Network

Last updated: March 27, 2015

« Nuclear Power and the Environment Hydropower »

About EIA | Open Data | Press Room | Careers | Contact Us

U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585

Sources & Uses
Petroleum
Coal
Natural Gas
Renewable
Nuclear
Electricity
Consumption
Total Energy

Topics
Analysis & Projections
Environment
Markets & Finance
Today in Energy

Geography
States
Countries
Maps

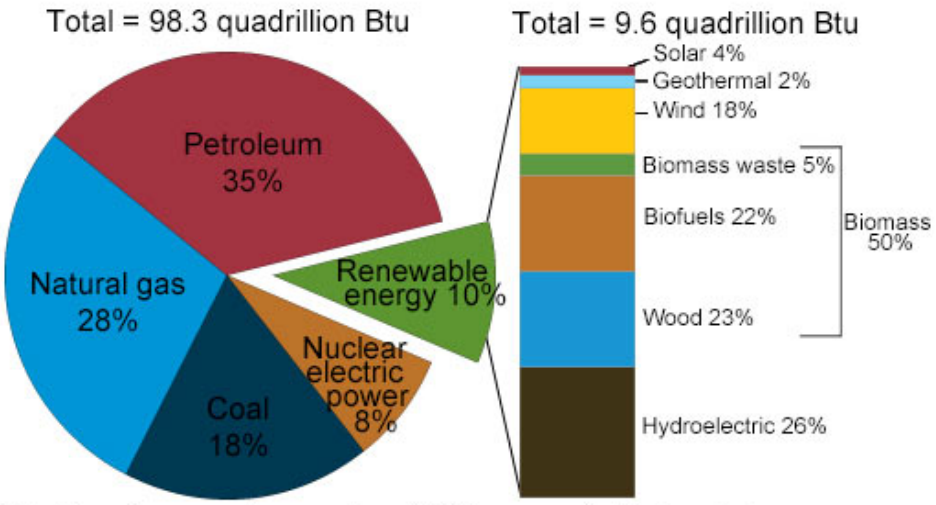
Tools
A-Z Index
All Reports & Publications
EIA Survey Forms
EIA Beta

Policies
Privacy/Security
Copyright & Reuse
Accessibility

Related Sites
U.S. Department of Energy
USA.gov
FedStats

Stay Connected
Facebook
Twitter
YouTube
Flickr
LinkedIn
Email Updates
RSS Feeds

U.S. energy consumption by energy source, 2014



Note: Sum of components may not equal 100% as a result of independent rounding.

Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3 and 10.1 (March 2015), preliminary data

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Renewable Energy

Pre-reading questions:

1. Before you read the text on renewable energy sources, take a moment and consider what you might know already about the topic. How do renewable energy sources help to protect the environment?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. According to the author how are renewable energy sources different from fossil fuels and what are the most commonly used renewable energy sources in the U.S.?

4. According to the author what are the benefits of renewable energy sources?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What are some of the reasons that renewable energy has not been used more to date?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

Ethanol: Pros and Cons

Video

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

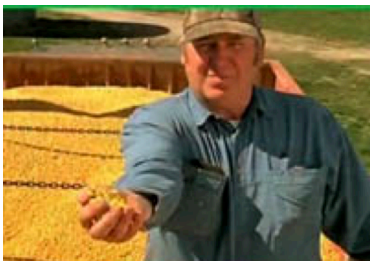
Objective Options:

- Students will consider how the use of ethanol impacts greenhouse gases and water supplies.
- Students will compare the benefits and costs of using corn-based ethanol as an energy source.
- Students will identify aspects of a video that reveal an author's point of view
- Students will cite specific textual evidence to support analysis of an author's purpose.
- Students will determine who might benefit from and who might be harmed by each message.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.A
	ESS3.D
C3 Framework Social Studies Dimension 2 Concepts	D2.Eco.2.6-8
	D2.Geo.4.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.6
	CCSS.ELA-LITERACY.RH.6-8.7
	CCSS.ELA-LITERACY.WHST.6-8.1.A

Vocabulary:
ethanol, agricultural fuel, greenhouse gas

Media Type(s): TV commercial, video public service announcement



Ethanol: Now is the Time Commercial
National Corn Growers Association, 2010
0:30 min.



Biofuels Disaster for Food, People and Planet
PSA, Canadian Biotechnology Action Network, 2008, 1:21 min

Preparation and Materials:
*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use These Materials* section.

Preparation:
- Download and review the *How to Use These Materials* section associated with this kit.

Materials for the Lesson:
- Two-page *Student Handout: Pros and Cons*
- Two-page *Student Worksheet: Pros and Cons of Biofuels*
- Two video clips

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions below based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the two videos. Example ELA and media literacy responses are included on the next page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Sustainability: Food, Water & Agriculture – Lesson 18: Biofuels

Connections to Project Look Sharp Lesson Resources:
Global Media Perspectives – Lesson 3: Food Crisis in Africa, video 3
Media Constructions of Sustainability: Finger Lakes – Lesson 20, video 1

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- How does the use of ethanol impact environmental health?
- How does the use of ethanol impact fresh water supplies?

Social Studies

- What are the benefits and costs of the energy source represented in this media example?
- How do the decisions to use this energy source influence the local and global environment?

ELA

- What is the video producer's perspective about ethanol as an energy source?
- What evidence do you see in the document to support your analysis of the message?
- How do the claims about the energy source differ in each media example?

Media Literacy

- Who might benefit from this message and who might be harmed by it?
- What techniques did the producer use to convey the message?
- What is left out of this message that might be important to know?
- What would you need to know to assess the credibility of these media documents?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?

Writing Prompt for Synthesis Assessment in the Sub-Topic, *Ethanol*

Summarize the costs and benefits of using ethanol as an energy source. Take a position about whether you think the government should support ethanol production and why.

Example ELA and Media Literacy Responses

ELA

Questions: What is the video producer's perspective about ethanol as an energy source?
What evidence do you see in the document to support your analysis?
How do the claims about the energy source differ in each media example?

Possible Answer: Doc 1: Ethanol is a good energy source.
Evidence: protects national security & environmental health, creates jobs; it's renewable, abundant and safe
Possible Answer: Doc 2: Ethanol is not a good energy source.
Evidence: drives up food prices, increases greenhouse gas emissions, clear cuts forests, depletes water supplies

Media Literacy

Question: Who might benefit from this message and who might be harmed by it?

Possible Answers: Doc #1 might benefit the National Corn Growers Association and the ethanol industry they represent by encouraging support for ethanol production as an environmentally friendly and economically sound investment in a national energy source.
Doc 1 might harm those who argue against ethanol production by making ethanol seem like an clean, affordable and abundant energy source.
Doc 2 might benefit people those working against ethanol production by suggesting that ethanol can increase food insecurity and is environmentally damaging to air, water and forest ecosystems.
Doc 2 might harm the ethanol industry in general by disputing its claims that ethanol is environmentally friendly and economically wise.

Question: What techniques did the producer use to convey the message?

Possible Answers: Doc 1: The ominous images and quiet drone highlight dangers of economic dependence on foreign oil supplies followed by uplifting strings and images of cornfields with farmers, scientists, families suggesting that ethanol will lift communities.
Doc 2: The fast-speaking narrator stands in front of a gas station to make the point that ethanol use as an additive in gasoline increases our dependence on a gasoline-based economy which is harmful to the environment.

Question: What would you need to know to assess the credibility of these media documents?

Possible Answers: **Doc 1**: Where and when did the producers get the statistic that the U.S. imports 62% of its oil? Why was the source not cited? How does ethanol production safeguard the environment when others say that growing corn for ethanol destroys natural habitats and depletes water resources?
Doc 2: Who is the speaker and what makes him an authority on this issue? Where and when did the producers get the statistic that in the last year the global food bill raised by one trillion dollars? Why was the source not cited? How much of the increase in food prices is due to ethanol production as opposed to other factors?



Will the Development of Biofuels, Such as Ethanol, Reduce Greenhouse Gas Emissions?



Will the Development of Biofuels, Such as Ethanol, Reduce Greenhouse Gas Emissions?

PRO (yes)

The US Department of Energy's Office of Energy Efficiency and Renewable Energy published the following information on its website in a section titled "Environmental Benefits of Biofuels" (accessed July 8, 2008):

> *"Biofuels can provide a number of environmental advantages over conventional fossil fuels—most notably a reduction in greenhouse gas (GHG) emissions. Since the transportation sector accounts for about a third of total U.S. emissions of carbon dioxide (an abundant GHG), cleaner transportation fuels can play an important role in addressing climate change.*
>
> *The level of GHG emissions associated with a particular biofuel depends on the energy used in growing and harvesting the feedstock, as well as the energy used to produce the fuel (e.g., coal, natural gas, biomass). On a full fuel-cycle basis, corn ethanol has the potential to reduce greenhouse gas emissions by as much as 52% over petroleum-based fuels. Even better, ethanol made from cellulosic feedstocks, such as switchgrass, or agricultural residues such as corn stover, has the potential to reduce greenhouse gas emissions by as much as 86%, compared to gasoline.*
>
> *Biofuels have the added benefit of providing a 'carbon sink.' As crops grow to produce the feedstocks for making the biofuel, they absorb carbon dioxide from the atmosphere."*

July 8, 2008 - United States Department of Energy (DOE) ☆

CON (no)

The UK Renewable Fuels Agency, an official UK government body, in its July 2008 report titled "The Gallagher Review of the Indirect Effects of Biofuels Production," stated that:

> *"[T]he displacement of existing agricultural production, due to biofuel demand, is accelerating land-use change and, if left unchecked, will reduce biodiversity and may even cause greenhouse gas emissions rather than savings…*
>
> *Although there are high levels of uncertainty in the data, the science and in the modelling of the indirect effects of biofuels, the balance of evidence shows a significant risk that current policies will lead to net greenhouse gas emissions and loss of biodiversity through habitat destruction. This includes effects arising from the conversion of grassland for cropland."*

July 2008 - UK Renewable Fuels Agency ☆

David Biello, Associate Editor at *Scientific American*, wrote in his Feb. 7, 2008 article "Biofuels Are Bad for Feeding People and Combating Climate Change," that:

> "Converting the grasslands of the U.S. to grow corn results in excess greenhouse gas emissions of 134 metric tons of CO_2 per hectare - a debt that would take 93 years to repay by replacing gasoline with corn-based ethanol. And converting jungles to palm plantations or tropical rainforest to soy fields would take centuries to pay back their carbon debts...
>
> Ethanol demand in the U.S., for example, has caused some farmers to plant more corn and less soy. This has driven up soy prices causing farmers in Brazil to clear more Amazon rainforest land to plant valuable soy...Because a soy field contains far less carbon than a rainforest, the greenhouse gas benefit of the original ethanol is wiped out..."

Feb. 7, 2008 - David Biello ☆☆☆

The National Resources Defense Council (NRDC), wrote in its Dec. 2004 study "Growing Energy: How Biofuels Can Help End America's Oil Dependence," that:

> *"The United States does not have to rely on oil to drive our economy and quality of life. We can replace much of our oil with biofuels - fuels made from plant materials grown by American farmers. These fuels, especially those known as cellulosic biofuels, can be cost-competitive with gasoline and diesel, and allow us to invest our energy dollars at home. They can also slash global warming emissions, improve air quality, reduce soil erosion, and expand wildlife habitat…*
>
> *Biofuels could reduce our greenhouse gas emissions by 1.7 billion tons per year - equal to more than 80 percent of transportation-related emissions and 22 percent of total emissions in 2002…*
>
> *Advanced biofuels technologies that produce both fuel and electricity would be able to displace more than 2 barrels of oil and 1.28 tons of greenhouse gases per dry ton of biomass used."*

Dec. 2004 - Natural Resources Defense Council ☆

The Renewable Fuels Association wrote in its fact sheet "Ethanol Facts: Environment," published on www.ethanolrfa.org (accessed Oct. 6, 2008), that:

> "Ethanol is a renewable fuel produced from plants, unlike petroleum-based fossil fuels that have a limited supply and are the major contributor of carbon dioxide emissions, a greenhouse gas.
>
> FACT: Using ethanol in place of gasoline helps to reduce carbon dioxide (CO_2) emissions by up to 29% given today's technology.
> Because ethanol is made from renewable, plant-based feedstocks, the CO_2 released during a vehicle's fuel combustion is 'recycled' by the plant as it grows (photosynthesis). New technologies, additional feedstocks, and higher blends of ethanol including E85 all promise greater CO_2 reductions. In 2007, ethanol use in the U.S. reduced CO_2-equivalent greenhouse gas emissions by approximately 10.1 million tons, equal to removing more than 1.5 million cars from America's roadways ."

Oct. 6, 2008 - Renewable Fuels Association ☆

Jack Santa-Barbara, PhD, Director of the Sustainable Scale Project, wrote in a Sep. 2007 report for the International Fourm on Globalization titled "The False Promise of Biofuels," published on www.ifg.org:

> "It is true that growing corn sequesters carbon from the atmosphere. However, it is also true that using corn products as combustible fuel releases this carbon back into the air. So there is no net benefit in terms of greenhouse gas emissions. But more significant is that fossil energy used in planting and harvesting the corn, and the industrial processing of the corn into ethanol, are all additional greenhouse gas emissions. Farming activities account for a significant amount of the greenhouse gases created by corn ethanol. In addition, most ethanol plants are powered by coal, which has the highest amount of greenhouse gas emissions of all the fossil fuels. Industrial operations not powered by coal are powered by natural gas, which also emits significant amounts of greenhouse gases. So the outcome is a significant increase in greenhouse gas emissions from corn ethanol regardless of how it is produced…
>
> It must be concluded that corn ethanol's greenhouse gas emissions, as well as emissions from other agrofuels, are not climate friendly, and may be worse than those from petroleum based gasoline. In addition to these high levels of greenhouse gas emissions, corn ethanol produces a range of other pollutants and public health concerns."

Sep. 2007 - Jack Santa-Barbara, PhD ☆☆☆

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Pros and Cons of Biofuels

Pre-reading questions:

1. Before you read the text on the pros and cons of biofuels like corn-based ethanol, take a moment and consider what you might know already about the topic. What are biofuels and what are they used for?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. According to the authors, what different crops are referenced as potential sources for biofuels?

4. According to the webpage, what are some of the reasons to support biofuels?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What are some arguments against biofuels?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. There are no references for this reading. How does the lack of references affect your rating of the credibility of the overall web page?

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

Video

Hydropower Dams: To Build or to Dismantle?

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

- Students will consider how hydropower dams impact human and natural systems.
- Students will explain how cultural and economic perspectives about hydropower dams have changed over time.
- Students will read and analyze visual and print information in diverse texts.
- Students will analyze opposing claims related to hydropower dam building or removal.
- Students will reflect on the values represented in contrasting videos about hydropower dams .

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.A
	ESS3.C
	LS4.D
C3 Framework Social Studies Dimension 2 Concepts	D2.Geo.4.6-8
	D2.His.5.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.WHST.6-8.1.A
	CCSS.ELA-LITERACY.RH.6-8.7

Vocabulary:

hydropower, dam removal, renewable electricity, watershed restoration

Media Type(s): documentary video, web video



The Valley of the Tennessee
Documentary film: Office of the War Information, 1944
4:23 min.



The Restoration of the Elwha River
Internet video, Olympic National Park, 2011
5:48 min.

Preparation and Materials:

*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use Materials* section.

Preparation:
- Download and review the *How to Use Materials* section associated with this kit.

Materials for the Lesson:
- Two-page *Student Handout: Pros and Cons of Dam Removal*
- Two-page *Student Worksheet: Pros and Cons of Dam Removal*
- Two videos

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the two film clips. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Sustainability: Upper Elementary – Unit 2: Natural Resources, Lesson 2

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Sustainability: Middle School – Energy Sources: Hydropower
Media Constructions of Resource Depletion, Lesson 1, slide 13
Media Constructions of Resource Depletion, Lesson 2, Damming the Rivers

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- What impacts do dams have on human populations?
- How are freshwater resources affected by the construction and removal of dams?
- In what ways does the biodiversity change in freshwater systems when dams are built or removed?

Social Studies

- How do cultural patterns and economic decisions affect decisions to build or remove dams?
- How have people's perspectives about the value of large hydropower dam projects changed over time?

ELA

- What messages are given about hydropower dams?
- What evidence do you see in the document to support your analysis of the message?
- How do the claims about dams differ in each media example?

Media Literacy

- What values are suggested concerning the use of water as a resource?
- What storytelling techniques are used in this video? Where do you see the technique?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?

Writing Prompt for assessment in the sub-topic, *Hydropower Dams*

Draw evidence from the handout and the videos to support to or to oppose this statement:
"Large hydropower dams from my great grandparents' time should be removed to restore free rivers."

Example ELA and Media Literacy Responses

ELA

Questions: What messages are given about hydropower dams? How do the claims about dams differ in each media example? What evidence do you see in the document to support your analysis of the message?
Possible Answer: Doc 1: Dams control water supply to prevent damage from droughts or floods. Hydropower provides power for people.
Evidence: "releasing the water when it is needed, holding it in check;" image of topographical display of dam system; the word "power" repeated over and over; images of human needs filled by dam construction
Possible Answer: Doc 2: Early European settlers built dams for electric power on the Elwha River. The dam blocks salmon from swimming upstream to spawn. The Klallam people have historically relied on salmon for their survival and want the dam removed.
Evidence: "Thomas Aldwell's plan to harness the Elwha River and generate electricity was received with great enthusiasm in the community;" early photos of dam construction; "hopes are that our grandkids will see the same Elwha River that our grandparents saw; "old photos of Klallam people with large salmon they had caught

Media Literacy

Question: What values are suggested concerning the use of water as a resource?
Possible Answers: Doc 1 suggests that water is an available resource for people's use and should be used to improve the human condition. People should take pride in the ability of their government to control the flow of rivers through such enormous construction projects
Doc 2 suggests that humans should preserve the natural waterways in their original state and find ways to maintain water resources without destroying the natural world.

Question: What storytelling techniques are used in this video? Where do you see the technique?
Possible Answers: Doc 1: Animation is used to illustrate water control when the topographic map animation shows path of water controlled by the dam system. The musical score matches the messages. Drums and horns underscore patriotic power when dams are named. Flutes provide uplift as uses of power are named.
Doc 2: Blending sound effects and music adds to the impact when the guitar blends with rushing waters. Old photos meshed with old music provides historical context when black and white photos from 1900s are shown backed by player piano music from that era.

Get your Wikispaces Classroom now: the easiest way to manage your class.
guest | Join | Help | Sign In

DamRemoval293

Wiki Home
Recent Changes
Pages and Files
Members
Search

Pros and cons of Dam Removal

Edit 0 1 É

Removing any dam comes with uncertain consequences that may result in both positive and negative effects on the surrounding environment. Because it incorporates a wide array of stakeholder wants and opinions, the removal of a dam should be a well thought out process. The decision to remove a dam, therefore, must be supported by evidence from scientific communities, results from other removal projects in similar aquatic systems, and by the vast majority of stakeholders.
In support of removal:

One of the reasons to support dam removal is rehabilitation of a healthy aquatic ecosystem that will provide desired ecosystem services. One study by Bednarek et al investigating the consequences of removing the Woolen Mills Dam in Wisconsin found that a newly unaltered flow regime allowed many species of native fish to return to that habitat, while non-native fish populations declined in abundance. Transporting formerly impounded sediment downstream allowed the formation of important fish spawning habitat including pool and riffle areas and gravel and cobblestone streambed reaches, ultimately increasing the biotic diversity within the river. Dammed rivers result in a more lake-like environment in which there is warmer water, and free-flowing rivers are usually colder environments. Because a free-flowing river contains more cold-water species like salmon, trout, and sturgeon, dam removal promotes economically desirable fisheries.
Dam removal may benefit the terrestrial environment as well. Another study by Orr et al investigating the effects of dam removal in multiple Wisconsin sites found that plant species diversity and abundance were both positively correlated with time since removal of a dam. Increased riparian zones allows for more bird and mammal habitat, such as bear, elk, moose, wolf, and beaver. This can result in increased hunting and trapping opportunities, providing even more money for state wildlife agencies.

In opposition of removal:

One argument against the removal of a dam is the cost and uncertainty regarding the process and outcomes. Unfortunately, very few long-term studies exist regarding dam removal that managers can base decisions off. Dam removal can be very expensive. For example, the Boardman river dams removal project is estimated to cost around eight million dollars. With that large of an investment, one would want to be sure that the outcomes would be desirable. Some studies have shown that removing a dam may cause supersaturation within the river. Supersaturtion occurs when large amounts of sediment are suddenly released following removal, resulting in increased turbidity and reduced oxygen levels. Massive sediment releases can destroy important spawning and hiding habitats, as well as food resources. Depending on the material used to construct the dam and artificial material built up behind the dam, removal may cause large amounts of lethal toxins to be released downstream. Further, removing dams that provide electric power results in the loss of energy generation. This loss may be filled by creating more power from non-clean energy sources like coal.

References:

1. "The Ecology of Dam Removal: A summary of benefits and impacts." *American Rivers*. Accessed: 26 November 2009. http://www.americanrivers.org

1. Bednarek, Angela T. 2001. "Undamming rivers: A review of the ecological impacts of dam removal." *Environmental Management*. 27(6): 803-814.

1. The Boardman River Dams Project. Accessed: 26 November 2009. theboardman.org

1. Orr, C.H., and E.H. Stanley. 2005. "Vegetation development and restoration potential of drained

Help · About · Blog · Pricing · Privacy · Terms · **Support** · **Upgrade**
Contributions to https://damremoval293.wikispaces.com/ are licensed under a Creative Commons Attribution Share-Alike 3.0 License. (cc) BY-SA
Portions not contributed by visitors are Copyright 2016 Tangient LLC
TES: The largest network of teachers in the world

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Pros and Cons of Dam Removal

Pre-reading questions:

1. Before you read the text on the pros and cons of removing hydropower dams, take a moment and consider what you might know already about the topic. Why might people want to remove a dam?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. According to the authors what conditions must be met before deciding to remove a dam?

4. What are some of the reasons to support dam removal?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What are some arguments against dam removal?

6. Add two questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

PowerPoint

Exploring the Impact of Hydrofracking on Aquifers

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

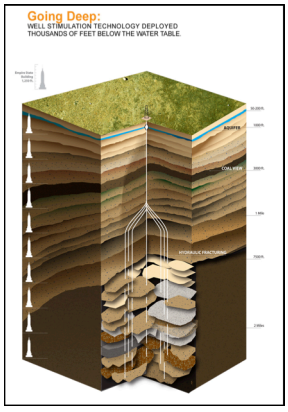
- Students will consider how hydrofracking impacts freshwater resources.
- Students will reflect on the impact of economic decisions on local environments.
- Students will identify and distinguish techniques in scientific diagram construction to convey different messages about the use of hydrofracking technology.
- Students will assess the credibility of conflicting sources using evidence from the texts to support their conclusions.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.A
	ESS3.C
C3 Framework Social Studies Dimension 2 Concepts	D2.Eco.1.6-8
	D2.Geo.4.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RST.6-8.6
	CCSS.ELA-LITERACY.RST.6-8.7
	CCSS.ELA-LITERACY.WHST.6-8.8

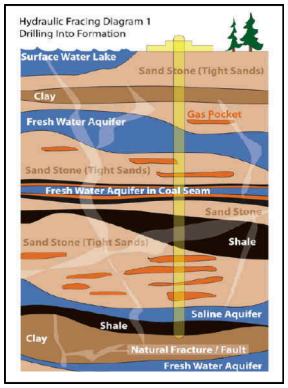
Vocabulary:

hydrofracking, aquifer, shale gas, fault

Media Type(s): scientific diagrams



Going deep
Webpage diagram: Independent Petroleum Association of America, 2011



Drilling into Formation
Web page diagram: Journey of the Forsaken, 2012

Preparation and Materials:

*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use Materials* section.

Preparation:
- Download and review the *How to Use Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: What is Shale Gas? How Does Fracking Work?*
- Two-page *Student Worksheet: Hydrofracking*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Sustainability: Finger Lakes – Lesson 24: Hydrofracking, Media & Credibility

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Sustainability: Middle School – Energy Sources: Hydrofracking Pros & Cons

Watch a six minute video of a college class decoding these charts: Go to www.projectlooksharp.org, Videos, Media Decoding Examples, Hydrofracking, Media & Credibility

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- What are the potential dangers of aquifer contamination from hydrofracking?
- As energy demands increase with a growing population how can engineering technologies minimize negative impacts on earth systems?

Social Studies

- How does the decision to use hyrdofracking technology to produce shale gas influence the natural environment and the daily lives of people in nearby and distant places?
- How do economic decisions regarding energy production affect the well-being of individuals, businesses and society?

ELA

- What messages on the environmental impact of hydrofracking does the diagram suggest?
- What evidence do you see in the document to support your analysis of the messages?
- Why might the creator of this diagram have chosen to illustrate hydrofracking technology in this way?

Media Literacy

- What information is left out of these diagrams that might be important to know?
- What questions might you ask about these diagrams in order to judge their credibility?
- What do I learn about myself from my analysis of these diagrams?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?

Writing Prompt for assessment in the sub-topic, *Hydrofracking & Aquifers*

Draw evidence from the handout and the diagrams to support to or to oppose this statement: "Hydrofracking technology is a good engineering strategy to meet our country's energy needs."

Example ELA and Media Literacy Responses

ELA

Questions: What messages on the environmental impact of hydrofracking does the diagram suggest? What evidence do you see in the document to support your analysis of the messages?
Possible Answer: Doc 1: There is little potential danger to the freshwater aquifer.
Evidence: The drill heads appear to be more than a mile beneath the aquifer making water table contamination by the drilling process unlikely.
Possible Answer: Doc 2: There is significant potential danger to the aquifer.
Evidence: The drill head appears to be located in a thin layer of shale and clay located between a saline aquifer and a fresh water aquifer. This makes it appear likely that chemicals from the hydrofracking process could penetrate into the aquifers and thus contaminate the water table.

Question: Why might the creator of this diagram have chosen to illustrate hydrofracking technology in this way? NOTE: Possible answers based on brief online research.
Possible Answer: Doc 1: The Independent Petroleum Association of America wants to highlight their perspective that hydrofracking is an environmentally safe technology that will help to meet national energy needs while at the same time supporting their corporate goals.
Doc 2: Lisa Bracken is an opponent of hydrofracking whose website, Journey of the Forsaken, proclaims the environmental dangers of the technology as illustrated in her diagram.

Media Literacy

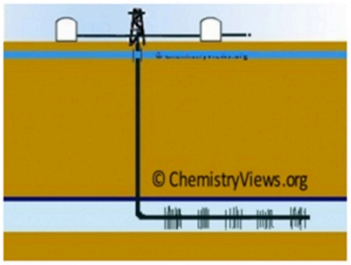
Question: What information is left out of these diagrams that might be important to know?
Possible Answers: Doc 1: Not all aquifers are as close to the surface as shown in this diagram. Not all shale deposits are as far from the surface as shown in this diagram. Not all hydrofracking sites are engineered to drill in the particular target zone pattern shown here. The impacts on local vegetation and wildlife habitats as the area around drill sites is initially cleared.
Doc 2: Not all drilling sites stand above multiple aquifers and shale deposits as shown in this diagram. Not all shale deposits or aquifers are as close to the surface as shown in this diagram. Not all hydrofracking sites stand next to lakes and forests as shown here. The different production capacities for gas drilling in tight sands and shale.

Question: What questions might you ask about these diagrams in order to judge their credibility?
Possible Answers:

- Who created the diagram?
- In what context was it used?
- Who paid for its use?
- What is the mission of the producer?
- When was it made?
- Are there texts or diagrams from other sources that confirm or challenge this interpretation?
- Given the widely varied geologic locations of aquifer and shale gas deposits how can a single diagram reflect the reality of hydrofracking impacts on freshwater resources?

Email: Password: Remember Help | Remind | Register
ChemistryViews
Brought to you by WILEY-VCH & ChemPubSoc Europe
Search All Content Types All Subjects / Themes Go
Search Wiley Online Library
Home ChemViews Magazine Inorganic Organic Physical Analytical Bio Industrial
News | Webinars | Videos | Education | Books | Journals | Portals | Events | Societies | Suppliers | Advertorials
Home > Industrial > Education > What is Shale Gas? How Does Fracking Work?
SHARE

What is Shale Gas? How Does Fracking Work?



Author: Vera Köster
Published Date: 05 February 2013
Copyright: Wiley-VCH Verlag GmbH & Co. KGaA

Everywhere you can read about the shale gas rush in North Dakota, Texas, and Montana, all USA. USA is the largest producer of shale gas. Their shale gas production rose from 2000 to 2010 from 2 to 23 % overall gas production with the trend still rising [1].
How does hydraulic fracturing (fracking) and horizontal drilling make natural gas trapped in shale rock formations financially feasible and accessible?

Related Articles

News: Foreign Investment in U.S. Shale Industry

News: Free-trade Agreements for US and Europe

News: Shale Gas in Europe

Magazine: Fracking Chemicals

Shale Gas

Shale is a compressed fine-grained type of sedimentary rock. It was formed from mud silt, clay, and organic matter.

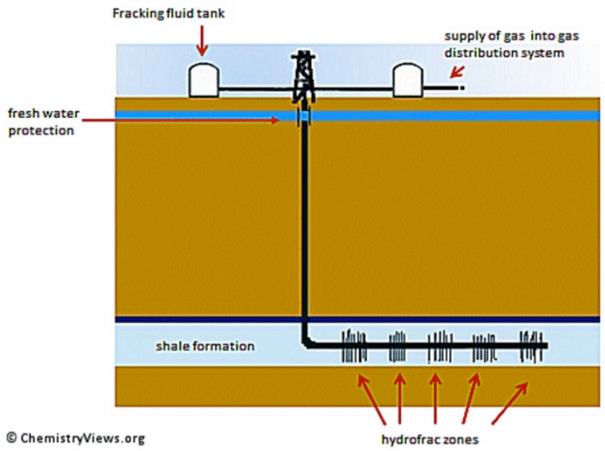
Shale gas is natural gas trapped within tiny pore spaces in shale formations. It is a hydrocarbon gas mixture. It consists mainly of methane. Other hydrocarbons are natural gas liquids (NGLs) like ethane, propane, and butane, and it also contains carbon dioxide, nitrogen, and hydrogen sulfide.

Horizontal Drilling and Fracking

Horizontal drilling allows drilling vertically several thousand meters (typically 6,000 m) deep and then turning 90 ° and drilling horizontally.

This makes it possible to operate multiple target zones from one drilling pad. It enlarges recoverable reserves and also productivity is significantly increased.

Hydraulic fracturing or fracking creates fractures in the shale formation to release the gas.
A fracturing fluid is pumped under high pressure (ca. 100 bar) into the drilling pipe to widen fractures in the rock or to create new ones.
The fluid consists mainly of water. It is usually mixed with quartz sand and three to twelve chemicals which amount for 0.5 to 2 %. The exact compositions are kept secret by the drilling companies.

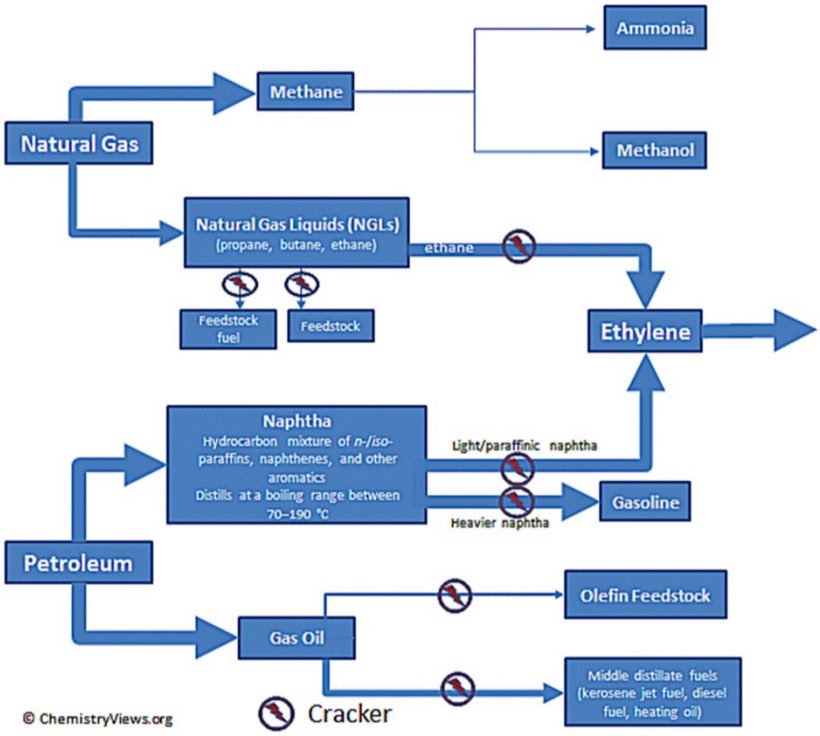


Most Read
Education: Tips and Tricks for the Lab: Column Trou...
Society: ChemPubSoc Europe
Education: Tips and Tricks for the Lab: Column Choi...
Society: Gesellschaft Deutscher Chemiker (GDCh; G...
Education: Tips and Tricks for the Lab: Column Pack...
Most Read in 2015

Approximately 7–15 million L of water are used per well [2]. The sand holds the cracks open to increase the amount of natural gas that can be extracted. The chemicals may include gels or butyldiglycol (typical 0.2 L/t water) that increase the viscosity of the fracking fluid to better transport the sand, foaming agents like CO_2 and N_2, to transport the sand, biocides to prevent growth of bacteria at organic components, acids like HCl, acetic acid, formic acid or boric acid to disintegrate the minerals of the rock formations, and anti-corrosion agents to protect the site when acid is added.

Approximately 50–70 % of the water solution is recovered. The remaining water stays in the ground. The recovered water is contaminated with chemicals and salts from the rock formation. It is either transported or directly disposed in treatment facilities.

What to do With Shale Gas?



Cracking means to separate the large hydrocarbon chains of fossil fuels like natural gas and petroleum.

Naphtha is related to the price of oil, which is set by global supply and demand. The natural gas prices are regional.
Ethylene is the most widely used organic compound in chemical industry.
In the USA, over 85 % of ethylene is derived from natural gas. In Western Europe, over 70 % is derived from naphtha and other light distillated oil-based products.
Therefore, the shift toward more and lower-cost natural gas has benefitted the chemical industry in the USA.
Here, it currently costs $ 300 to produce 1 ton of ethylene. In Asia it costs $ 1,717 and in Saudi Arabia $ 455 [3, 4].

Concerns

Among the environmental concerns are that enormous amounts of water are used and the water is contaminated by the layers of earth it is pumped through as well as the fracking chemicals.
The cement to protect the ground water can get leaky with time, especially if acid water is used.
Radon and mercury are gases which can leak out from the shale formation. Other subsurface materials like lead or arsenic may be mobilized.
It cannot be excluded that fractures in rock formations grow in higher rock/soil formations or up to the surface.
Small earthquakes, so called induced seismicity, might result from changing the balance of forces in the rock formations.
There also are the concerns regarding energy politics, fearing that the hype can change the understanding that shale gas is a transition and not a replacement fuel.
Also methane, which is the main component of natural gas, is a potent greenhouse gas. It is poorly understood what impact increasing shale gas industry has on the climate. [1, 2]

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

References

[1] A. Kotsakis, The Regulation of the Technical, Environmental and Health Aspects of Current Exploratory Shale Gas Extraction in the United Kingdom. Initial Lessons for the Future of European Union Energy Policy, *Rew. Europ. Com. Int. Environm. Law* **2012**, *21 (3)*, 282–290. DOI: 10.1111/j.1467-9388.2012.00759.x

[2] L. Reins, The Shale Gas Extraction Process and Its Impacts on Water Resources, *Rew. Europ. Com. Int. Environm. Law* **2011**, *20 (3)*, 300–312. DOI: 10.1111/j.1467-9388.2012.00733.x

[3] Kevin Bukkis, Shale Gas Will Fuel a U.S. Manufacturing Boom, *MIT Technology Review*, January 9, **2013**.

[4] *Shale Gas and New Petrochemicals Investment: Benefits for the Economy, Jobs and US Manufacturing*, American Chemistry Council (ACC), March **2011**.

Also of interest:

- Shale Gas: Impact on the Petrochemical Industry,
  ChemViews magazine **2013**.
  DOI: 10.1002/chemv.201300015
  Development of shale oil and gas has opened new sources of oil, natural gas, and key petrochemical feedstocks
- Shale Oil Worldwide,
  ChemistryViews.org 10 December 2012.
  US and Canada seem to remain the main countries to take economic advantage of shale development for some time

---

Article Information
DOI: 10.1002/chemv.20130001

Article Views: 45213

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Hydrofracking

Pre-reading questions:

1. Before you read the text on hydrofracking take a moment and consider what you might know already about the topic. Why might people support or oppose hydrofracking as a technology to deliver energy resources?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. According to the author why was hydrofracking technology developed and how does it work?

4. What are some products that are made from shale gas production?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What are some arguments against hydrofracking technology?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

Hydrofracking Pros & Cons: Arguing the Case

Video

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

- Students will consider how hydrofracking impacts the biosphere.
- Students will reflect on the benefits and costs of natural gas drilling.
- Students will identify and distinguish techniques in video construction to convey different messages about the use of hydrofracking technology.
- Students will assess the credibility of conflicting sources using evidence from the texts to support their conclusions.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.C
	ESS3.D
C3 Framework Social Studies Dimension 2 Concepts	D2.Eco.2.6-8
	D2.Geo.4.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.6
	CCSS.ELA-LITERACY.RH.6-8.7
	CCSS.ELA-LITERACY.WHST.6-8.1.A

Vocabulary:
hydrofracking, natural gas drilling, toxic, wastewater, climate change, renewable energy technology, domestic fuel, energy security

Media Type(s): TV commercial; Internet PSA



Connecting the Dots
TV commercial, American Petroleum Institute, 2013
:30 min.



Don't Frack Ohio
Internet PSA, Water Defense, 2012
1:05 min.

Preparation and Materials:

*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use Materials* section.

Preparation:
- Download and review the *How to Use Materials* section associated with this kit.

Materials for the Lesson:
- Two-page *Student Handout: Hydraulic Fracturing and Health*
- Two-page *Student Worksheet: Hydrofracking Health Effects*
- Two videos

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the two film clips. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Sustainability: Finger Lakes – Lesson 24: Hydrofracking, Media & Credibility

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Sustainability: Middle School – Energy Sources: Hydrofracking & Aquifers

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- What are the potential impacts to the biosphere from hydrofracking?
- What claims are made about the impact of hydrofracking on climate change?

Social Studies

- What are the benefits and costs of natural gas produced by hydrofracking technology as represented in this media example?
- How does the decision to use hyrdofracking technology to produce shale gas influence the natural environment and the daily lives of people in nearby and distant places?

ELA

- What messages does the video give about the impacts of hydrofracking on people and the environment?
- What evidence do you see in the document to support your analysis of the messages?
- Why might the creator of this video have chosen to illustrate hydrofracking technology in this way?

Media Literacy

- What sound and images have been chosen to communicate the producer's assertions?
- What information is left out of these videos that might be important to know?
- What questions might you ask about these videos in order to judge their credibility?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?

Writing Prompt for assessment in the sub-topic, *Hydrofracking Pros & Cons*

Draw evidence from the handout and the videos to support to or to oppose this statement: "Hydrofracking technology is a good engineering strategy to meet our country's energy needs."

Example ELA and Media Literacy Responses

ELA

Questions: What messages does the video give about the impacts of hydrofracking on people and the environment? What evidence do you see in the document to support your analysis?

Possible Answer: Doc 1: Natural gas produced by hydrofracking is good for both the economy and the environment.

Evidence: Economy: "new jobs," "manufacturing renaissance," "energy security," "reenergized American economy;" Environment: "cleaner air," "safe, proven hydrofracking technology," "clean burning"

Possible Answer: Doc 2: People oppose fracking because of its negative environmental and health impacts.

Evidence: Opposition: "growing movement against fracking," "people are standing up to say no to fracking;" Negative impacts: "not safe," "toxic legacy," "poison our water," "toxic fumes," "radioactive wastewater," "causes earthquakes," "climate disaster"

Question: Why might the creator of this video have chosen to illustrate hydrofracking technology in this way? NOTE: Possible answers based on brief online research.

Possible Answer: Doc 1: The sponsor of this video, American Petroleum Institute (API), is the national trade association that represents all aspects of America's oil and natural gas industry. As such API wants to present a positive view of its products to maximize industry profit.

Possible Answer: Doc 2: Water Defense, the sponsor of this video, is a non-profit organization dedicated to clean water. They believe that access to clean water is a fundamental human right. As such they want to present a negative view of a technology – hydrofracking – which they consider to be a threat to clean water resources.

Media Literacy

Question: What images have been chosen to communicate the producer's assertions?

Possible Answers: Doc 1: Jobs: workers in uniform; Environmental safety: trees & grass, butterflies; Advanced technology: robotics, computer screen; Security: family birthday party; Natural gas: soft blue flames lifting; Hydrofracking technology: diagram w/ layers of steel pipe and cement protecting groundwater

Doc 2: This is serious: A famous actor speaks directly to the camera without smiling; Toxic: discolored drinking water; Water quality threats: river at dawn; Earthquake danger: red spiral centered on Youngstown, OH, site of alleged fracking induced quake

Question: What information is left out of these videos that might be important to know?

Possible Answers: Doc 1: The industry's response to the environmental concerns raised in doc 2 related to toxins in the air and water from the fracking process, climate disruption from methane leaks and earthquakes initiated by fracking wells. **Doc 2:** Water Defense's response to the loss of economic benefits (jobs, exports, manufacturing renaissance) if hydrofracking is not allowed.

Question: What questions might you ask about these videos in order to judge their credibility?

Possible Answers: What are the sources for the assertions made in this video? Are those sources credible? How do I know? Who paid for this video and how is the mission of the sponsors reflected in the choices of words and images chosen for the video and the choices of what to leave out?

National Institute of Environmental Health Sciences
Your Environment. Your Health.

Hydraulic Fracturing and Health

What is hydraulic fracturing?

Hydraulic fracturing, or fracking, is a method used to extract natural gas and oil from deep rock formations known as shale. Using this method, drilling operators force water, sand, and a mix of chemicals into horizontally drilled wells, causing the shale to crack and release natural gas or oil.

Hydraulic fracturing is one part of a broader process known as unconventional natural gas development, which refers to all operations associated with fracked wells, from well construction to the transport of gas and oil off the site.

Does hydraulic fracturing pose health risks to the people living near drilling sites?

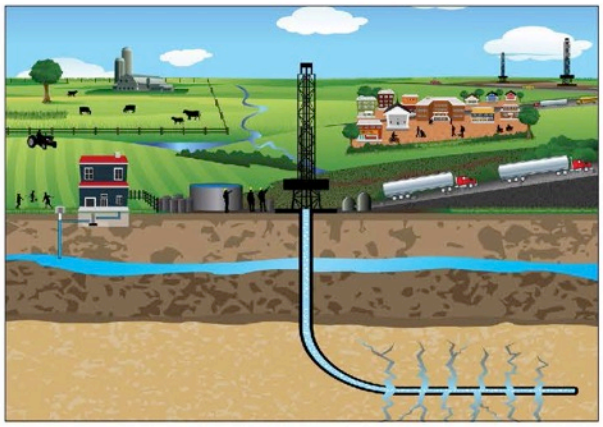
The short answer is we don't know. Although research is underway, few studies to date have provided conclusive evidence about how unconventional natural gas development affects nearby communities. Residents, environmental advocates, and some researchers have expressed concerns about potential effects on water, air, and communities.[1,2]

Water quality

In some cases, it may be possible for natural gas and hydraulic fracturing-associated chemicals to travel through cracks in the rock into an underground drinking water source. Water contamination could also occur if a well is improperly installed, if chemicals are spilled from trucks or tanks, or if flowback is not effectively contained. Flowback is when water used in the hydraulic fracturing process flows out of the well. The extent of water contamination from these sources is currently unknown.

Air quality

Drilling sites can potentially affect local air quality in several ways. First, any process involving combustion can release toxic chemicals into the air. For example, the burning off, or flaring, of excess natural gas; the operation of heavy equipment at the well site; and the use of diesel trucks to transport materials to and from a site may all contribute to air pollution. In addition, the chemicals and sand used in the hydraulic fracturing process, as well as other chemicals that surface with the natural gas, may potentially become airborne and affect air quality. Since operators are not always required to divulge the specific chemicals used, the extent of air pollution and the potential dangers to local communities are not well understood.



(Image courtesy of the University of North Carolina at Chapel Hill Center for Environmental Health and Susceptibility, University of Rochester Environmental Health Sciences Center, and University of Cincinnati Center for Environmental Genetics.)

Community impacts

The changes associated with building and having a drilling site can have numerous impacts on community well-being. Some of these impacts may be positive. For example, a drilling operation can increase local employment rates, and result in greater access to health care. Drilling-associated activities, and a sudden influx of a large transient workforce, can also have negative impacts on a community. These may include increased noise, light, and traffic; heavier burdens on local infrastructure and resources, such as roads and hospitals; higher rates of crime and substance abuse; and changes to community character.

Hydraulic fracturing, or fracking, is just one part of the unconventional natural gas development process.

PO Box 12233 • Research Triangle Park, NC 27709
Phone: 919-541-3345 • **www.niehs.nih.gov**
December 2014

National Institutes of Health
U.S. Department of Health and Human Services

♻ Printed on recycled paper

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

National Institute of Environmental Health Sciences

Are there health risks to the people who work at drilling sites?

Most of what is known about the health risks from unconventional natural gas development comes from studies of workers at these sites. While studies of worker exposures and health are limited, ongoing efforts continue to gather important insights. Currently, three hydraulic fracturing-specific health risks have been identified, in addition to risks, such as accidents, that are often associated with industrial occupations involving the use of heavy equipment.

1. Silica sand inhalation: Without proper protection, workers may inhale fine particles of silica sand, the type of sand used in the hydraulic fracturing process. Inhaling these particles can cause lung diseases.[3]
2. Exposure to chemical spills: Accidental chemical spills may expose workers to compounds used in the hydraulic fracturing process, presenting a variety of health risks.
3. Exposure from flowback operations: Initial field studies suggest that workers performing certain operations may be exposed to high levels of volatile hydrocarbons, which can be acutely toxic. Exposures have resulted in the deaths of at least four workers involved in flowback operations, since 2010.[4]

What is NIEHS doing to increase understanding of these issues?

NIEHS provides funding for research and community outreach, to investigate and address potential health impacts related to hydraulic fracturing. Some ongoing activities include the following:

- A study examining patterns of pregnancy and asthma outcomes among more than 50,000 people in relation to Marcellus shale hydraulic fracturing. (Led by Brian Schwartz, Geisinger Clinic, Danville, Pennsylvania)
- An investigation of potential pregnancy risks experienced by women living near Barnett shale hydraulic fracturing sites. (Led by Kristina Whitworth, University of Texas Health Sciences Center, Houston)
- A study assessing markers of stress, inflammation, cardiovascular health, and quality of life among people in communities with and without hydraulic fracturing. (Led by John Adgate, University of Colorado, Denver)
- The Inter-Environmental Health Sciences Core Center Working Group on Unconventional Natural Gas Drilling Operations, which brings together NIEHS grantees to recommend research directions and approaches. (Led by Trevor Penning, University of Pennsylvania)

The value of community-engaged research

Community-engaged research promotes the active involvement of community residents in all stages of a research study, from design and data collection, to reporting and follow up. This approach has proven to be valuable in addressing a wide range of environmental health problems, and is seen as particularly beneficial for studies focused on the health impacts of unconventional natural gas development.[5]

Benefits for researchers

- Informs research questions and methods.
- Expands the type and amount of data that can be collected.
- Increases impact of research.

Benefits for communities

- Opportunity to influence what gets studied.
- Can increase the value of research in decision-making.
- Chance to participate in early and open sharing of study results.

For more information on the National Institute of Environmental Health Sciences, go to **www.niehs.nih.gov.**

[1] Adgate JL, Goldstein BD, McKenzie LM. 2014. Potential public health hazards, exposures and health effects from unconventional natural gas development. Environ Sci Technol 48(15):8307-8320.

[2] U.S. Department of Energy, U.S. Department of the Interior, U.S. Environmental Protection Agency. 2014. Federal Multiagency Collaboration on Unconventional Oil and Gas Research: A Strategy for Research and Development. Available: http://unconventional.energy.gov/pdf/Multiagency_UOG_Research_Strateg.pdf [accessed 5 December 2014].

[3] OSHA (Occupational Health and Safety Administration). 2012. Hazard Alert: Worker Exposure to Silica during Hydraulic Fracturing. Available: www.osha.gov/dts/hazardalerts/hydraulic_frac_hazard_alert.html [accessed 5 December 2014].

[4] Snawder J, Esswein E, King B, Breitenstein M, Alexander-Scott M, Retzer K, Kiefer M, Hill R. 2014. NIOSH Science Blog: Reports of Worker Fatalities During Flowback Operations. Available: http://blogs.cdc.gov/niosh-science-blog/2014/05/19/flowback [accessed 5 December 2014].

[5] Penning TM, Breysse PN, Gray K, Howarth M, Yan B. 2014. Environmental Health Research Recommendations From the Inter-Environmental Health Sciences Core Center Working Group on Unconventional Natural Gas Drilling Operations. Environ Health Perspect 122(11):1155-1159.

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Hydrofracking Health Effects

Pre-reading questions:

1. Before you read the text on hydrofracking take a moment and consider what you might know already about the topic. What are some of the concerns related to the possible health effects of hydrofracking technology?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. What are some of the potential environmental health effects of hydrofracking?

4. What are some of the potential workplace health effects on people who work at hydrofracking drilling sites?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. How are the authors of the handout, the National Institute of Environmental Health Sciences, working to deal with possible health effects related to hydrofracking?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

THEME 2: Biodiversity

Sub-Topic: Species Preservation
Activity Plan 121
Student Materials.....125
Sub-Topic: Interrelationships
Activity Plan 131
Student Materials.....135
Sub-Topic: Rachel Carson
Activity Plan 141
Student Materials.....145
Sub-Topic: Climate
Activity Plan 149
Student Materials.....153
Sub-Topic: Habitat Destruction
Activity Plan 159
Student Materials.....163
Sub-Topic: Invasive Species
Activity Plan 169
Student Materials.....173
Sub-Topic: Pollution
Activity Plan 179
Student Materials.....183
Sub-Topic: Trophy Hunting
Activity Plan 187
Student Materials.....191
Sub-Topic: Oil Palm Plantations
Activity Plan 197
Student Materials.....201

ACTIVITY PLAN

Video

Species Preservation: Seeking Solutions

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

- Students will consider reasons and methods for species conservation.
- Students will reflect on how people take action to address local and global problems related to the loss of biodiversity.
- Students will read and analyze visual and print information in diverse texts.
- Students will cite specific textual evidence to support analysis of secondary sources.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ETS1.B
	LS4.D
C3 Framework Social Studies Concepts	D4.6.6-8
	D4.7.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.1
	CCSS.ELA-LITERACY.RH.6-8.2
	CCSS.ELA-LITERACY.RH.6-8.7

Vocabulary:

Biodiversity, endangered species, ecosystem services, conservation, habitat

Media Type(s): documentary film



America's Endangered Species: Don't Say Good-bye. Documentary Film, National Geographic, 1997
2:57 min.



Saving Species Documentary Film, BBC, 2007
3:21 min.

Preparation and Materials:
*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use These Materials* section.

Preparation:
- Download and review the *How to Use These Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: The Value of Endangered Species*
- Two-page *Student Worksheet: Why Save Endangered Species?*
- Two videos

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the two film clips. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Endangered Species – Lesson 2: Human/Animal Relations

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Endangered Species – Lesson 1: slides 2, 3, 17, 19, 22, 40, 47, 48

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- In what ways can changes in biodiversity impact people?
- In what ways are people working on solutions to the problems of biodiversity loss?

Social Studies

- How might we see the loss of biodiversity on local and global levels?
- What are some things that individuals and communities can do to help preserve species?

ELA

- What messages are suggested about species preservation?
- What evidence do you see in the film clip to support your analysis?

Media Literacy

- What techniques does the filmmaker use to convey their message?
- What values are suggested regarding human efforts to preserve biodiversity?
- What kind of actions might one take in response to this film?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?

Writing Prompt for Synthesis Assessment in the Sub-Topic, *Interrelationships*

Draw evidence from the handout and the film clips to write about these questions: "Why should people care when another species is at risk of extinction? What can an individual do to help stop the extinction of an entire species?"

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested about species preservation? What evidence do you see in the film clip to support your analysis?

Possible Answer: Doc 1: Some people have no contact with wildlife and may not care about species preservation. For others preservation efforts bring mystery, service, and privilege.
Evidence: No contact - Arthur naming many wild creatures absent from his neighborhood.
Mystery - the young man's expression of curiosity at the caterpillar and by Arthur's explanation of the caterpillar's metamorphosis into a moth.
Service - Arthur's explanation of the group's intent to "help…save an endangered species."
Privilege - Arthur is one of "just three people who are permitted to gather the butterfly" and his affirmation that "I love my work."

Doc 2: Humans need biodiversity for current and future biosystem services. Humans are responsible as stewards for wildlife. Humans cannot know why other species share the planet and should be humble in our ignorance.
Evidence: Professor Wangari Maathai- We are a small part of an enormous and incomprehensible system and we want and for future generations we need to conserve other species.
Friends of the Earth Executive Director Tony Juniper – We need food medicines and industrial applications from within the natural world.
Professor Robert May – Potential gene pool discoveries and ecosystem services benefit humans and we are responsible as stewards.
Professor E.O. Wilson – Humankind derives free ecosystem services in the amount of 30 trillion dollars from air and water purification and pollination.

Media Literacy

Question: What techniques does the filmmaker use to convey their message?

Possible Answers: Doc #1: By choosing to focus on the story of one young man the filmmaker invites the viewer to relate to someone who initially has little connection to other species as he walks in his neighborhood but later finds deep meaning and purpose in his vocation to help protect the endangered butterfly population.
Doc 2: The filmmaker mixes compelling images of the natural world with interviews with well-respected experts who give a context for human concern for other species.

Question: What values are suggested regarding human efforts to preserve biodiversity?
Possible Answers: Doc 1 offers values of nonviolence ("It was full of violence"), caring ("Help us out to save an endangered species"), stewardship ("Nature deserves to be everywhere") and dedication ("I'm very dedicated to coming down here.")
Doc 2 supports values of humility ("Humans are a very small part of the system"), responsibility ("We have a responsibility for stewardship"), gratitude ("We are getting an immense value from ecosystem services") and respect ("We should have a lot of respect for the natural system.")

UF UNIVERSITY of FLORIDA
IFAS Extension

SSWIS14

The Value of Endangered Species: the Importance of Conserving Biological Diversity[1]

Frank J. Mazzotti[2]

Background

A species is endangered when it is threatened with extinction. Since time began, countless species have gone extinct from natural processes. The extinction of dinosaurs is the best known example.

Why Save Endangered Species?

If extinction is a natural process, why should we make an effort to save endangered species? Because we can no longer attribute the accelerating extinction of plants and animals to natural causes. Today most species of plants and animals become extinct because of habitat destruction (loss of living space to development or pollution), introduction of non-native organisms, and direct killing (over-harvesting, poisoning). Florida's endangered wildlife includes the American crocodile (Figure 1), loggerhead sea turtle (Figure 2), the West Indian manatee (Figure 3).



Figure 1 .

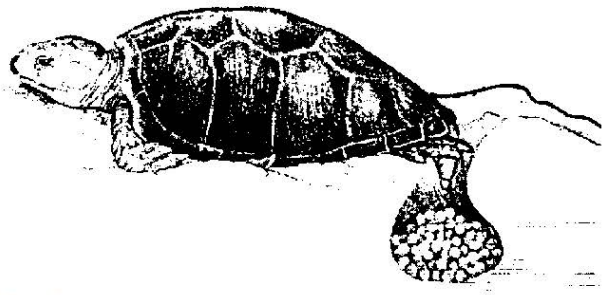


Figure 2 .

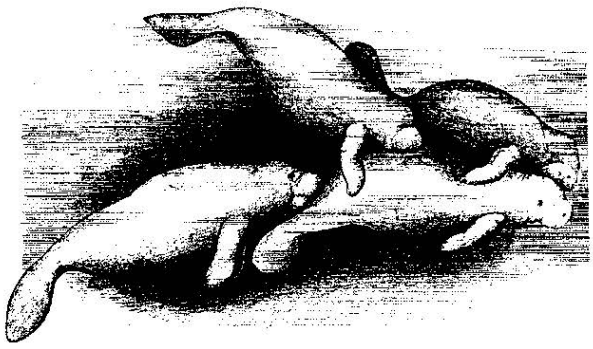


Figure 3 .

Changing Perceptions

Our understanding of the value of endangered species to humans has increased together with the recognition that

1. This document is SSWIS14, one of a series of the Wildlife Ecology and Conservation, UF/IFAS Extension. Original publication date December 1990. Revised September 2002. Reviewed June 2014. Visit the EDIS website at http://edis.ifas.ufl.edu.

2. Frank J. Mazzotti, Ph.D., associate professor, Wildlife Ecology and Conservation department, University of Florida, Everglades REC, Belle Glade, FL 33430, UF/IFAS Extension. Gainesville, 32611.

The Institute of Food and Agricultural Sciences (IFAS) is an Equal Opportunity Institution authorized to provide research, educational information and other services only to individuals and institutions that function with non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, marital status, national origin, political opinions or affiliations. U.S. Department of Agriculture, Cooperative Extension Service, University of Florida, IFAS, Florida A. & M. University Cooperative Extension Program, and Boards of County Commissioners Cooperating. Millie Ferrer-Chancy, Interim Dean

human activities cause extinction. In general, benefits of species can be classified as ecological, economic, and social. Different combinations of benefits occur for any particular species, and some species are obviously more "valuable" than others.

More important than knowing why a particular species is valuable is understanding why so many kinds of plants and animals are valuable.

Biological Diversity

The assemblage of populations of plants and animals in an area is termed its "biological diversity." The term biological diversity is often used interchangeably (sometimes confusingly) with two other terms, "genetic diversity" and "ecological diversity." Genetic diversity (amount of genetic variability among individuals of the same species) and ecological diversity (number and relative abundance of species) are both components of biological diversity.

Genetic diversity is directly related to a species' ability to survive environmental change. For example, plants and animals can be characterized by their ability to exist under different climatic (moisture and temperature) conditions.

However, within different species there is a certain amount of variability in the tolerance of individuals to climatic conditions. The ability of different species to cope with environmental--in this example climatic-- change depends on this variability. When genetic variability is reduced, as with the Florida panther, the risk of extinction increases.

The loss of a single species can set off a chain reaction affecting many other species. The total impact of extinction is not always apparent, and is difficult to predict, but it is clear that conserving biological diversity is essential for maintaining intact ecosystems.

Benefits of Biological Diversity

How does maintaining biological diversity benefit humanity? It only takes a moment to realize that throughout history plants and animals have provided humans with food, clothing, energy, medicines, and structural materials. Today, solutions to problems in agricultural production in tropical countries, reliance on petrochemicals, and the cures for cancers may lie in organisms not yet discovered. It would be a shame to lose these benefits without even knowing we had them.

ECOTOURISM

One way that conservation of biological diversity is being linked directly to economic and social development is through a relatively new process called ecological tourism, or simply ecotourism. This is particularly important in developing countries that otherwise could not afford conservation programs. Example:The exploitation of renewable natural resources (woods, nuts, oils) in tropical rain forests may bring greater economic benefits than conversion to more intensive land uses.

AGRICULTURAL BENEFITS

Only a small proportion of the world's plants have been cultivated for food on a large-scale basis. Wild plants can benefit modern agriculture as sources for new crops, genetic material to improve existing crops, and as sources of new biodegradable pesticides. Many of our common foods have tropical origins and it is natural to turn to tropical forests as a source for new crops. The tropics are also a source for relatives of commercial species. Continual crossbreeding is necessary to improve crop yield, nutritional quality, adaptiveness to different growing conditions, and resistance to pests and diseases. Undiscovered plants have a great potential for providing new medicines. Many plants have developed chemical defenses to deter animals that eat them. These plants may becultivated to provide sources of bio-degradable pesticides in the future. Wild plants are also important as a source for new medicines. At least 25 per cent of all prescription drugs dispensed in the United States contain active principals that arestill extracted from higher plants. We should never forget that a lowly mold gave us penicillin.

UNRECOGNIZED BENEFITS

Unrecognized benefits of maintaining biological diversity are those services we receive when ecosystems function normally. These ecosystem functions include energy fixation, chemical cycling (oxygen production by rainforests), soil generation and maintenance, ground water recharge, water purification, and flood protection. These services are provided to us at no cost.

When we destroy the ability of ecosystems to function naturally we not only lose these free services but all too often have to pay to replace them. There is no more dramatic example of the problems caused by ecosystem degradation and species endangerment than the loss of wetlands, especially the Everglades, in Florida.Floods, problems in water quality and quantity for natural and human systems, and declines in fish and wildlife populations have all been

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

linked to the drainage of the Everglades. The price tag for fixing these problems is hundreds of millions of dollars.

SPECIES AS INDICATORS

Certain species are especially important as indicators of environmental quality. Endangered species act as our miner's canary, they tell us when something is wrong in our life-support system. The rapid decline in bald eagles and peregrine falcons was a dramatic warning of the dangers of DDT.

Many non-endangered species are used to monitor environmental quality. In Florida, largemouth bass and other sportfish have warned us of mercury contamination in freshwater ecosystems, and the spread of cattails into freshwater marshes formerly dominated by sawgrass warned us of nutrient problems in the Everglades. Without environmental monitors, we may not have learned of these contaminants until much more damage was done.

What You Can do

The conservation and management of threatened and endangered species is a tremendous challenge. Because of efforts of federal, state, regional, and local agencies--sometimes in cooperation with private interests--some endangered species now have a better chance of survival. The involvement of every individual, especially private citizens is essential. The following list includes some of the things you can do to help save endangered species:

- Support the Nongame Program of the Florida Game and Freshwater Fish Commission
- Visit a national, state or local park where resident naturalists describe local ecosystems. Look into volunteer activities at these locations.
- Attend public hearings concerning land and water use decisions. Regional planning Councils, water management districts, and county and city commissions are all charged with the responsibility of making decisions affecting biological diversity. Become informed, then involved.
- Report violations of conservation laws to federal and state authorities
- Plant a refuge for wildlife (and energy and water conservation). Contact your local County Extension Office for more information on landscaping for wildlife.

Endnote

The illustrations in this document are reprinted with the permission of Florida Power and Light Company.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Why Save Endangered Species?

Pre-reading questions:

1. Before you read the text on the importance of conserving biodiversity, take a moment and consider what you might know already about the topic. Why might humans want to preserve biodiversity?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. What are some reasons that species become endangered?

4. How do people benefit from biodiversity?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What can people do to help protect endangered species?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom of page one. How do the references affect your rating of the credibility of the overall web page?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

Interrelationships: Human & Buffalo

Video

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

- Students will consider the interdependent relationships between people and buffalo.
- Students will reflect on the impact of buffalo hunting on Native American societies.
- Students will read and analyze visual and print information in diverse texts.
- Students will identify aspects of a film construction that reveal a filmmaker's purpose.
- Students will cite specific textual evidence to support analysis of secondary sources.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.C
	LS2.A
C3 Framework Social Studies Dimension 2 Concepts	D2.Eco.6.6-8
	D2.Geo.8.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.1
	CCSS.ELA-LITERACY.RH.6-8.6
	CCSS.ELA-LITERACY.RH.6-8.7

Vocabulary:

bison, buffalo, Theodore Roosevelt, extermination, poacher, regulations, Yellowstone

Media Type(s): documentary film



Earth and the American Dream.
Documentary Film, HBO, 1993
2:54 min.



The National Parks: America's Best Idea
Documentary Film, PBS, 2009
2:43 min.

Preparation and Materials:
*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use These Materials* section.

Preparation:
- Download and review the *How to Use These Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: Buffalo Tales: The Near Extermination of the American Bison*
- Two-page *Student Worksheet: People and Buffalo : Extermination and Protection*
- Two videos

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the two film clips. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Endangered Species – Lesson 2: Human/Animal Relations

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Endangered Species – Lesson 1: slides 2, 3, 9, 13, 41, 43, 50

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- In what ways have humans and buffalo relied on one another for survival?
- What human activities caused the near extinction of the buffalo?

Social Studies

- How did the economic concept of supply and demand factor in the near extermination of the buffalo?
- How did economic decisions made in east coast markets impact the cultural patterns of Indian people living in the western plains in the 19th century?

ELA

- What messages are suggested about the near extermination of the buffalo?
- What evidence do you see in the video to support your analysis?
- How does the filmmaker view Theodore Roosevelt's role in the near extermination of the buffalo?

Media Literacy

- What techniques does the filmmaker use to convey their message?
- What values are suggested regarding human relationships with other species?
- What is left out of this message that might be important to know?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?

Writing Prompt for Synthesis Assessment in the Sub-Topic, *Interrelationships*

Draw evidence from the handout and the videos to write about this question: "Which factor was most important in saving the buffalo from extinction: cooperative efforts among Native American peoples or regulations imposed by Congressional legislation?"

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested about the near extermination of the buffalo? What evidence do you see in the video to support your analysis?

Possible Answer: Doc 1: The U.S. government and military sought to exterminate the buffalo in order to destroy the Native American people whose material and spiritual survival were tied to the buffalo.
Evidence: The slow pans of the buffalo remains and the massacred bodies of Native Americans accompanied by the words of George Catlin show that the filmmaker views the extermination of the buffalo and the Indian as a purposeful U.S. government strategy.
Doc 2: The near extinction of the buffalo was averted by the timely intervention of journalists who persuaded Congress to act to protect Yellowstone Park and the last remaining buffalo herds.
Evidence: The narrative about the publication of the newspaper story and photos about buffalo poaching and its impact on Congress shows that the filmmaker views advocacy journalism and regulatory legislation as the main reason for the salvation of buffalo.

Question: How does the filmmaker view Theodore Roosevelt's role in the near extermination of the buffalo?

Possible Answer: Doc 1: Roosevelt is quoted as saying, "the extermination of the buffalo has been a blessing."
Doc 2: Narrator says, "Theodore Roosevelt…saw places like Yellowstone as reservoirs…for wildlife."

Media Literacy

Question: What techniques does the filmmaker use to convey their message?

Possible Answers: Doc #1: By choosing 3 different sources and voices for the background narrative the filmmakers underscore the different perspectives brought by a U.S. president (Roosevelt), a sympathetic U.S. artist (Catlin) and a Kiowa chief (Satanta). The image of the Native American man crouching by the buffalo skull and Satanta's words in Kiowa and English "I love the land and the buffalo and will not part with it" emphasize the close relations between the Indian people and the buffalo.
Doc 2: The filmmaker uses archival photos to tell the story of newspaper editor who galvanized support for Yellowstone and contemporary interviews and footage of buffalo to explain the important role that people and government played in saving the buffalo.

Question: What values are suggested regarding human relationships with other species?

Possible Answers: Doc 1 suggests that there are very different values expressed by the three voices: Roosevelt values the spread of "white civilization in the west" over the lives of buffalo; Catlin values the beauty and nobility of the Indian and the buffalo; Chief Satanta feels love and unity with the land and the buffalo.
Doc 2 supports values of truth-telling in the form of investigative journalism, of caring about preserving natural places represented by Congressional response to the stories of buffalo slaughter and values of ecosystem awareness to preserve biodiversity as exemplified by the editor Grinell and Theodore Roosevelt.

Buffalo Tales: The Near-Extermination of the American Bison

Shepard Krech III, Brown University
©National Humanities Center

- Guiding Student Discussion
- Scholars Debate
- Links to Online Resources
- Illustration Credits
- Works Cited
- Comments & Questions

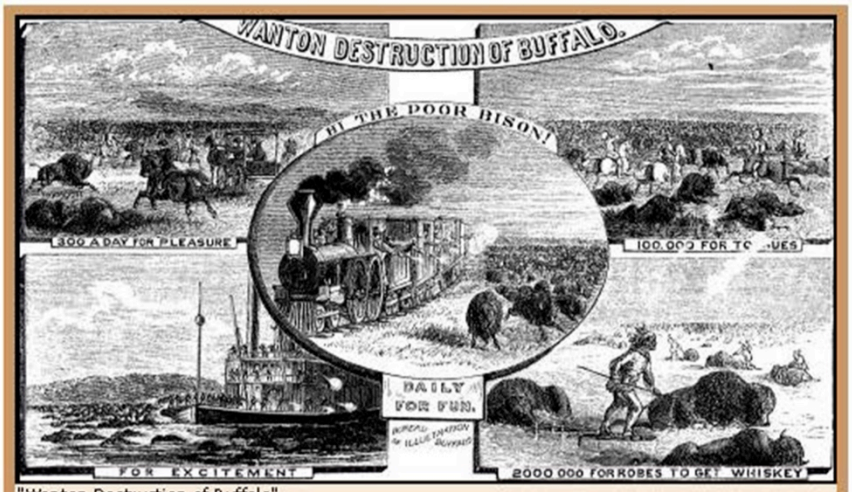
(part 3 of 4)



George Catlin — National Gallery of Art
Prairie Meadows Burning
1861/1869

The decline of the buffalo is largely a nineteenth-century story. The size of the herds was affected by predation (by humans and wolves), disease, fires, climate, competition from horses, the market, and other factors. Fires often swept the grasslands, sometimes maiming and killing buffaloes. Millions of horses in Indian herds competed for grasses. Drought was perhaps most significant; severe prior to the fifteenth century, and episodic in the eighteenth, it might have been worst at the very moment when other pressures converged in the early years of the decades from 1840 to 1880.

Yet no matter the impact from drought, horses, or fires, what doomed the buffalo most were (1) the commodities markets for buffalo tongues, skins, meat, and robes; and (2) the railroads, which provided the means of transportation to rapidly expanding European-American populations.



"Wanton Destruction of Buffalo"
in W. E. Webb, *Buffalo Land*, 1872
enlarge image



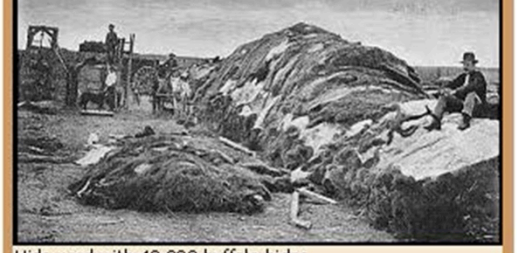
1872 National Archives
enlarge image

"the fury of the slaughter for hides and other products"

Again largely a nineteenth-century tale, the final stage from 1867 to 1884 was notable for the fury of the slaughter for hides and other products. In 1867 the first of five railroads split the herd in the heart of buffalo range, a process repeated again and again. Provisioners like Buffalo Bill Cody, sportsmen, farmers, and ranchers who craved the prairies for crops and cattle—all placed new pressure on bison. The railroads made transportation of buffalo hides easy and cheap, so market hunters flooded in, wasting three to five times the numbers they killed. The carnage from herds already depleted by other factors defied description: 4-5 million killed in three years alone. The commercial hunt was finished by the fall of 1883.

Indians, confined to reservations and distressed from hunger, took part until the bitter end—the Piegan until "the tail of the last buffalo" disappeared. The final shipment of hides took place in 1884. With very few exceptions, the buffalo was gone and bone collectors scooped up all the remains they could find for shipment east where they were processed into phosphate fertilizer.

National Archives



Hide yard with 40,000 buffalo hides
Dodge City, Kansas, 1878
enlarge image

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences



1870 National Archives

Thirty years ago millions of the great unwieldy animals existed on this continent.

Innumerable droves roamed, comparatively undisturbed and unmolested, . . . Many thousands have been ruthlessly and shamefully slain every season for past twenty years or more by white hunters and tourists merely for their robes, and in sheer wanton sport, and their huge carcasses left to fester and rot, and their bleached skeletons to strew the deserts and lonely plains.

"In the Prime of the Buffalo," J. F. Baltimore
The Overland Monthly and Out West Magazine
November 1889
full text

Today, one hundred years later, the buffalo has returned from the brink of extinction to roam the grasslands again in Yellowstone and beyond. Feared by farmers for diseases like brucellosis that they might carry to cattle herds, their fate beyond Yellowstone is uncertain, although Indian people have joined forces in a cooperative effort to save animals wandering from Yellowstone from the rifle, and to raise viable herds of this formerly vital, and currently deeply symbolic, animal. Yet it is no coincidence that in today's changing economy, when many Indians talk of the return of the buffalo, they mean not the animal but casinos.



Carsi/CAS

continued

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

Buffalo Tales: The Near-Extermination of the American Bison
Shepard Krech III, Brown University
©National Humanities Center

Works Cited

Bergon, Frank, ed. *The Journals of Lewis and Clark*. New York: Viking, 1989.

Dary, David. *The Buffalo Book: The Full Saga of the American Animal*. Athens: Swallow Press/Ohio University Press, 1989.

Ewers, John C. *The Blackfeet: Raiders on the Northwestern Plains*. Norman: University of Oklahoma Press, 1958.

Flores, Dan. "Bison Ecology and Bison Diplomacy: The Southern Plains from 1800-1850," *Journal of American History* 78:2 (Sept. 1991).

Haines, Francis. *The Buffalo: The Story of American Bison and Their Hunters from Prehistoric Times to the Present*. (New York: Crowell, 1970); Norman: University of Oklahoma Press, 1995.

Isenberg, Andrew. *The Destruction of the Bison: Social and Ecological Changes in the Great Plains, 1750-1920*. New York: Cambridge University Press, 2000.

Krech, Shepard, III. *The Ecological Indian: Myth and History*. New York: Norton, 1999.

McHugh, Tom. *The Time of the Buffalo*. New York: Knopf, 1972.

Medicine Crow, Joseph. *From the Heart of the Crow Country: The Crow Indians' Own Stories*. New York: Orion Books, 1992.

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- People and Buffalo: Extermination and Protection

Pre-reading questions:

1. Before you read the text on the near extermination of the buffalo, take a moment and consider what you might know already about the topic. What caused the near extinction of the buffalo?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. What are some natural causes that led to the near extinction of the buffalo?

4. What are some human-induced causes that led to the near extinction of the buffalo?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What have Indian people done to help protect the remaining bison herds?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

Video

ACTIVITY PLAN

Rachel Carson: Who Controls Nature?

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

- Students will consider the impact of DDT on the ecosystem.
- Students will reflect on the changes in perspectives about chemicals in the environment in the decades following World War Two.
- Students will read and analyze visual and print information in diverse texts.
- Students will cite specific textual evidence to support analysis of secondary sources.
- Students will determine the meaning of the phrases "balance of nature" and "modern science " as they are implied and used in the video.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.C
	LS4.D
C3 Framework Social Studies Dimension 2 Concepts	D2.Eco.2.6-8
	D2.His.5.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.1
	CCSS.ELA-LITERACY.RST.6-8.4
	CCSS.ELA-LITERACY.RH.6-8.7

Vocabulary:

DDT, pesticide, Rachel Carson, *Silent Spring,* unforeseen consequence, balance of nature

Media Type(s): TV documentary



Rachel Carson's Silent Spring
TV documentary, PBS, 1993
2:05 min.



The Silent Spring of Rachel Carson
TV documentary, CBS, 1963
0:48 min.

Preparation and Materials:
*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use These Materials* section.

Preparation:
- Download and review the *How to Use These Materials* section associated with this kit.

Materials for the Lesson:
- Two-page *Student Handout: The Life and Legacy of Rachel Carson*
- Two-page *Student Worksheet: Rachel Carson's Environmental Ethic*
- Two videos

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the two film clips. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Chemical in the Environment – Lesson 2: Rachel Carson

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Chemical in the Environment – Lesson 1: slides 7, 10-14, 32, 33, 46
Media Constructions of Chemical in the Environment – Lesson 3: Rachel Carson
Media Constructions of Endangered Species – Lesson 1: slide 37
Media Constructions of Endangered Species – Lesson 5: Case Study: Frogs & Atrazine

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- In what ways has pesticide use impacted natural habitats?
- How have changes in biodiversity brought about by pesticide use affected the natural resources and ecosystem services that humans rely on?

Social Studies

- What are the benefits and costs of choosing to use DDT and of choosing to stop the use of DDT?
- How have perspectives about DDT use and Rachel Carson changed over time?

ELA

- What messages are suggested about DDT and Rachel Carson?
- What evidence do you see in the video to support your analysis?
- What do these terms mean: ″balance of nature″ and ″modern science"? Give evidence to support your answer.

Media Literacy

- What techniques does the filmmaker use to convey their message?
- What is left out of this message that might be important to know?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?
- What questions do you have about this?

Writing Prompt for Synthesis Assessment in the Sub-Topic, *Rachel Carson*

Draw evidence from the handout and the videos to write about this question:
″How have people acted, individually and collectively, to address the environmental and social problems related to DDT use?″

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested about DDT and Rachel Carson? What evidence do you see in the video to support your analysis?
Possible Answer: Doc 1: Government and chemical industry endorse DDT as an effective means of insect control. The use of pesticides like DDT would result in a spring silent of birdsong, a prospect that moved Rachel Carson to write *Silent Spring*.
Evidence: Endorsing – "Government endorsing…industry pushing," Challenging - Carson's testimony as she recalls her friend, Olga Huckins' request.
Doc 2: Rachel Carson believes that the balance of nature cannot be repealed by people. A chemical industry representative says Rachel Carson is wrong and man controls nature.
Evidence: Carson - "One might just as soon repeal the law of gravity (as the balance of nature)." Industry – "The modern chemist believes (contrary to Ms. Carson) that man is steadily controlling nature."

Question: What do these terms mean: "balance of nature" and "modern science"? Give evidence to support your answer.
Possible Answer: Balance of nature has to do with the interrelationships between living things and their environment.
Evidence: Images of a waterfall, trees and a swirling leaf illustrate Carson's point of view about the interconnections implicit in the balance of nature.
Possible Answer: Modern science is represented by human experts who use technology to control the natural world.
Evidence: The industry representative is clothed in a lab coat and positioned in a laboratory with technical instruments while an image of a large scale hydropower dam illustrate his view that "the modern scientist" can control nature.

Media Literacy

Question: What techniques does the filmmaker use to convey their message?
Possible Answers: Doc #1: They use ominous background music with images of DDT spraying and dying birds to convey an uneasy feeling about pesticide use. They use an actress' voice as Carson with images of a typewriter writing a letter to underscore Carson's personal commitment.
Doc 2: The filmmaker uses two interviews, one with an industry spokesman and the other with Rachel Carson, to convey the conflicting viewpoints expressed. The intercut imagery from a high tech human project and from nature further contrasts these perspectives.

Question What is left out of this message that might be important to know?
Possible Answers: Doc #1: Where did the statistics come from? Who are the men who are speaking and why are they credible? What health impacts did the public experience from the spraying campaign?
Doc #2: What did government, industry and academic reports have to say about these issues during Carson's lifetime, when the film was made and now? What credentials did the industry representative and Ms. Carson have to support their credibility?



The Life And Legacy Of

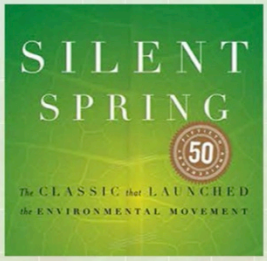
RACHEL CARSON

Biologist - Writer - Ecologist 1907 - 1964

- Home
- Biography
- Timeline
- Books
- Research Guide
- Organizations
- Rachel's Traces
- School Projects
- In Memoriam
- About Linda Lear
- Copyright



Underlying all of these problems of introducing contamination into our world is the question of moral responsibility -- responsibility not only to our own generation but to those of the future.



Perhaps the finest nature writer of the Twentieth Century, Rachel Carson (1907-1964) is remembered more today as the woman who challenged the notion that humans could obtain mastery over nature by chemicals, bombs and space travel than for her studies of ocean life. Her sensational book ***Silent Spring*** (1962) warned of the dangers to all natural systems from the misuse of chemical pesticides such as DDT, and questioned the scope and direction of modern science, initiated the contemporary environmental movement.

Pennsylvania, upstream from the industrial behemoth of Pittsburgh, she became a marine scientist working for the U.S. Fish and Wildlife Service in Washington, DC, primarily as a writer and editor. She was always aware of the impact that humans had on the natural world. Her first book, ***Under the Sea-Wind*** (1941) was a gripping account of the interactions of a sea bird, a fish and an eel -- who shared life in the open seas. A canny scholar working in government during World War II, Carson took advantage of the latest scientific material for her next book, ***The Sea Around Us*** (1951) which was nothing short of a biography of the sea. It became an international best-seller, raised the consciousness of a generation, and made Rachel Carson the trusted public voice of science in America. ***The Edge of the Sea*** (1955) brought CarsonÕs focus on the ecosystems of the eastern coast from Maine to Florida. All three books were physical explanations of life, all drenched with miracle of what happens to life in and near the sea.



© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences



In her books on the sea Carson wrote about geologic discoveries from submarine technology and underwater research -- of how islands were formed, how currents change and merge, how temperature affects sea life, and how erosion impacts not just shore lines but salinity, fish populations, and tiny micro-organisms. Even in the 1950's, CarsonÕs ecological vision of the oceans shows her embrace of a larger environmental ethic which could lead to the sustainability of natureÕs interactive and interdependent systems. **Climate change,** rising sea-levels, melting Arctic glaciers, collapsing bird and animal populations, crumbling geological faults -- all are part of CarsonÕs work. But how, she wondered, would the educated public be kept informed of these challenges to life itself? What was the public's "right to know"?

Evidence of the widespread misuse of organic chemical pesticides government and industry after World War II prompted Carson to reluctantly speak out not just about the immediate threat to humans and non-human nature from unwitting chemical exposure, but also to question government and private science's assumption that human domination of nature was the correct course for the future. In ***Silent Spring*** Carson asked the hard questions about whether and why humans had the right to control nature; to decide who lives or dies, to poison or to destroy non-human life. In showing that all biological systems were dynamic and by urging the public to question authority, to ask "who speaks, and why"? Rachel Carson became a social revolutionary, and ***Silent Spring*** became the handbook for the future of all life on Earth.



Biographical entry courtesy of Carson biographer Linda Lear, © 1998 (Revised 2015), author of *Rachel Carson: Witness for Nature* published by Houghton Mifflin Harcourt, 2009.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Rachel Carson's Environmental Ethic

Pre reading questions:

1. Before you read the text on the legacy of Rachel Carson, take a moment and consider what you might know already about the topic. Why is Rachel Carson considered by many to be one of the founders of the modern environmental movements?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. What life choices helped Rachel Carson prepare to become an environmental activist?

4. How would you describe Rachel Carson's environmental ethic?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What is Rachel Carson remembered for today?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

Climate: Climate Change & Biodiversity

PowerPoint

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

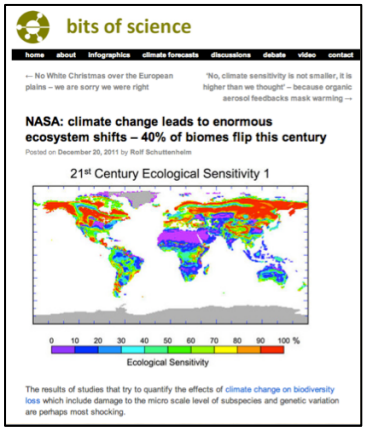
- Students will consider the impact of climate change on ecosystem biodiversity.
- Students will reflect on how environmental characteristics change and vary around the world.
- Students will read and analyze visual and print information in diverse texts.
- Students will integrate information expressed in words in text with a version of that information expressed in maps and diagrams.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.C
	ESS3.D
	LS2.C
C3 Framework Social Studies Concepts	D2.Geo.2.6-8
	D2.Geo.10.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RST.6-8.1
	CCSS.ELA-LITERACY.RST.6-8.7

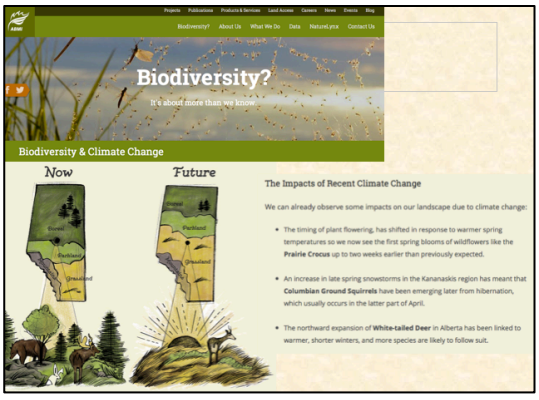
Vocabulary:

climate change, ecosystem, biome, biodiversity, genetic variation

Media Type(s): maps, webpage



NASA: Climate Change Leads to Enormous Ecosystem Shifts, webpage, Bits of Science, 2011



Biodiversity and Climate Change webpage, Alberta Biodiversity Monitoring Institute. 2014

Preparation and Materials:
*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use These Materials* section.

Preparation:
- Download and review the *How to Use These Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: Topics in Biodiversity Loss*
- Two-page *Student Worksheet: Habitat Loss and Biodiversity*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Global Warming – Lesson 5: The Consequences of Global Warming

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Endangered Species – Lesson 1: Slide 18

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- How has climate change impacted wildlife habitats?
- How has climate change affected natural resources and ecosystem services that people need?

Social Studies

- How does climate change alter the environmental characteristics of different places?
- What are some different ways in which maps can demonstrate the changes in environmental characteristics of particular places?

ELA

- What messages are suggested about climate change and biodiversity?
- What evidence do you see in the text and the map to support your analysis?

Media Literacy

- What techniques did the mapmaker use to underscore the impact of climate change?
- What is left out of this message that might be important to know?
- What might you ask to assess the credibility of this document?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?
- What questions do you have about this?

Writing Prompt for Synthesis Assessment in the Sub-Topic, *Climate*

Draw evidence from the handout and the images to support or oppose this statement: "Climate change poses a serious threat to all living things everywhere."

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested about climate change and biodiversity? What evidence do you see in the text and the map to support your analysis?

Possible Answer: Doc 1: Nearly all global ecosystems lose biodiversity as a result of climate change with the global north facing the most severe changes.
Evidence: Text: "Climate change leads to enormous ecosystem shifts," "the effects of climate change on biodiversity loss…include damage to the micro scale level." Map: Significant portions of the northern hemisphere appear in bright red signaling extreme ecological sensitivity.
Doc 2: Dramatic shifts in ecosystem biodiversity in one particular location, Alberta, Canada, will see forests shifting to grassland landscapes as a result of climate change.
Evidence: Text: "We can already observe some impacts on our landscape due to climate change" with examples of changes in blooming patterns of the Prairie Crocus, hibernation patterns of the Columbian ground squirrel and migration patterns of white-tailed deer.
Map: The highlighted location shows dramatic changes in flora and fauna from the forest landscape to the grassland landscape.

Media Literacy

Question: What techniques did the mapmaker use to underscore the impact of climate change?

Possible Answers: Doc 1 The mapmaker chose to represent the most extreme ecological sensitivity in bright red, a color associated with stop signs and danger alerts.
Doc 2 The mapmaker chose to highlight a specific location in Alberta that will experience dramatic biome shifts as a result of climate change. Had they chosen to highlight an area further to the north or further to the south they would not have been able to show such different flora and fauna in the representative drawing.

Question: What is left out of this message that might be important to know?

Possible Answers: Doc 1 Why is the map titled "Ecological Sensitivity 1?" Are there other projections that look different? How many and which studies were used to provide the data on which this map is based? What do they mean by "biome flip?"
Doc 2 What studies were used to provide the projections on which this map is based? How far into the future is "Future" map meant to represent? One year, ten years, one hundred years? What kind of landscape or habitat does "parkland" represent? Surely the borders of a park will not shift with climate change.

Question: What might you ask to assess the credibility of this document?

Possible Answers: Doc 1 The title of the source, "Bits of Science" sounds like it might be the name of an individual's web page. What credentials do the website producer and author of this post have to suggest that their information is accurate? Where is the specific reference to the NASA findings referenced in the title? What's the source of the map?
Doc 2 The source of this page, Alberta Biodiversity Monitoring Institute, sounds official but what institution are they affiliated with, if any? What studies provide the basis for the map, the artist drawings and the information on flora and fauna changes on this page?

Global Change Project

Paleontological Research Institution and its Museum of the Earth

Climate Change | Biodiversity Loss | Latest News | For Educators

TOPICS IN BIODIVERSITY LOSS

Does Biodiversity Change? *Is Biodiversity Changing Now?* *Biodiversity Loss and Humans*
Future for Biodiversity *What if Loss Occurs?* *What Can Be Done?* *Biodiversity Hotspots*

Current extinction rates are up to 100 times greater than natural, background extinction rates, because of the effect of humans on other organisms and ecosystems. We impact the world around us in many ways, some of which are more destructive than others. Here are some of the ways in which humans are causing other life forms to go extinct:

Overfishing

Overhunting

Habitat Destruction & Conversion

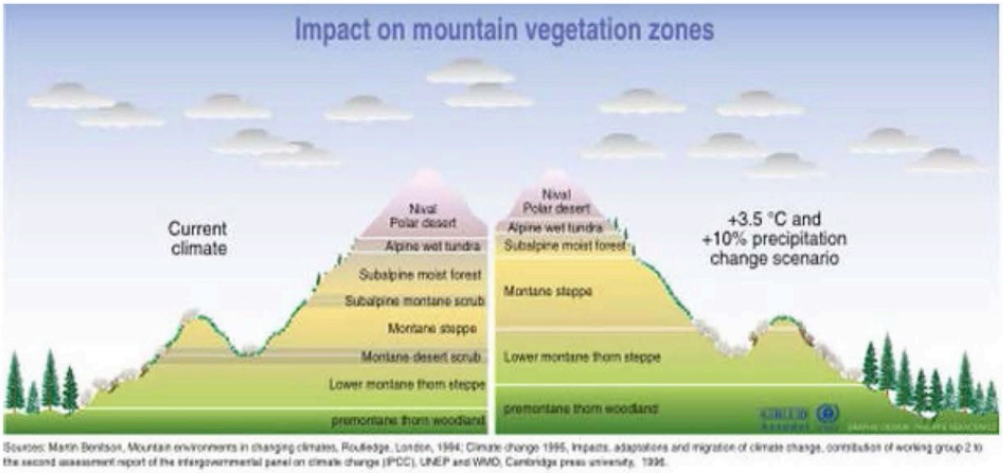
Habitat destruction occurs whenever humans change a landscape and alter the ecosystem that resides there. This occurs whenever a forest is cut down for pasture or a wetland is filled in to build a parking lot. Tropical rainforests are at high risk for this, as they are frequently cut down to create cropland and pasture for cattle.

Invasive Species Introductions

Introduction of invasive species can do irreparable damage to an ecosystem that is not prepared to cope with the intruders. A foreign plant might be able to out-compete all others in a given environment, driving out the other species and replacing them with a monoculture. Humans introduce microbes and soil particles relatively easily and unknowingly when they travel, and we have also introduced foreign species as pest controls at times.

Climate Change

Biodiversity is threatened by climate change largely because of loss of habitat. As sea levels and temperatures rise, plants and animals, just like humans, will be forced to relocate, to leave the places where they live and move into new areas. This graphic illustrates the effects of climate change on one type of habitat, mountains, as temperature and precipitation increase:

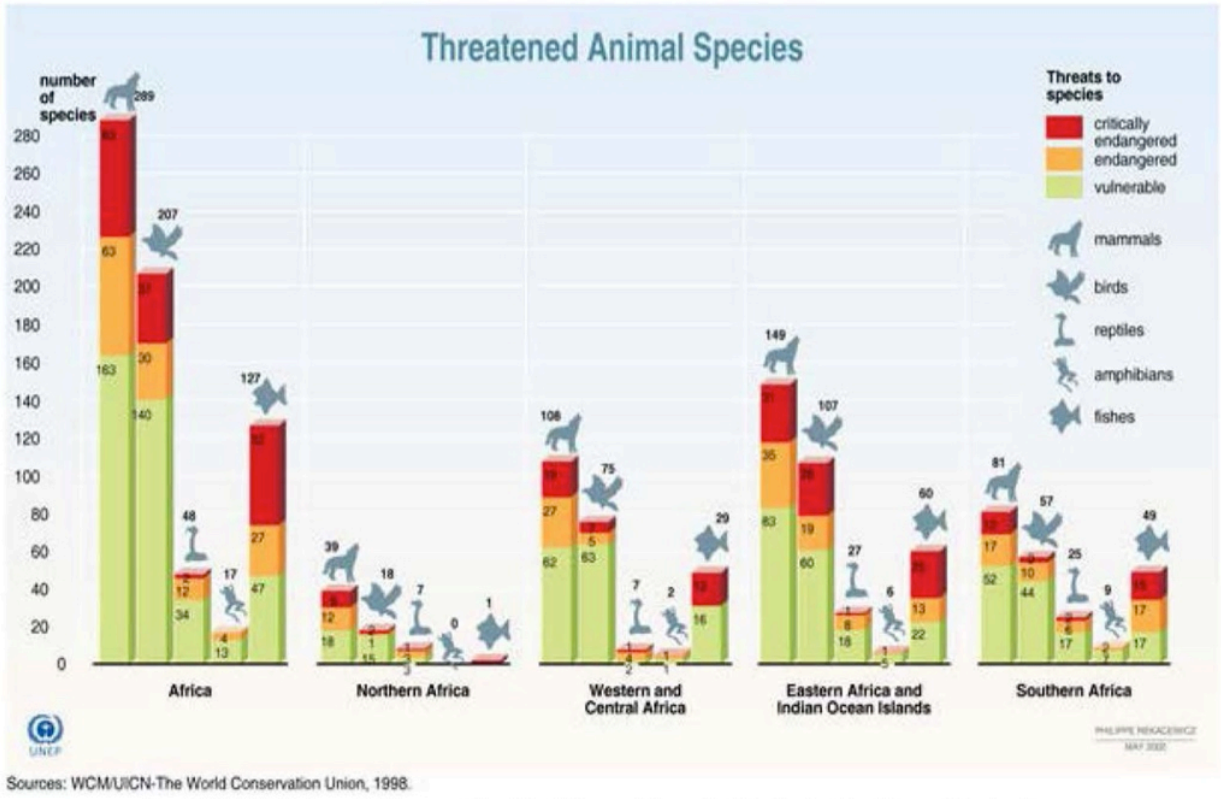


Sources: Martin Beniston, Mountain environments in changing climates, Routledge, London, 1994; Climate change 1995, Impacts, adaptations and migration of climate change, contribution of working group 2 to the second assessment report of the intergovernmental panel on climate change (IPCC), UNEP and WMO, Cambridge press university, 1996.

See UNEP/GRID Arendal Maps and Graphics Library, Climate Change Impact on Mountain Vegetation Zones

As the climate warms, the various habitat zones move up the mountain, and along the way species and ecosystems are invariably lost. The most vulnerable species are those that can only survive in a narrow zone of climate, such as within a certain temperature or precipitation range. If individuals cannot move quickly enough to stay within their required climate zone, they will perish.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences



See UNEP/GRID Arendal Maps and Graphics Library, African Wildlife Under Threat from Climate Change

This graphic shows the numbers of threatened and endangered animal species in Africa. The group of bars on the far left shows totals for all of Africa's different categories of animals (mammals, birds, reptiles, etc.), and the other four sets of bars are broken down by region within Africa. This shows the current status of threatened and endangered animals in Africa; climate change will only make this worse.

Closer to home, a March 19, 2007 article in the Washington Post described one likely effect of climate change on a familiar bird: the Baltimore Oriole. The state bird of Maryland will likely be driven out of that state within a century, as climate change shifts its range north and towards Philadelphia.

Glossary • Resources • Acknowledgements

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences


Global Change Project
Paleontological Research Institution and its Museum of the Earth
Climate Change
Biodiversity Loss
For Educators
Books
Ruddiman, William F. 2001. Earth's Climate: Past and Future. W.H. Freeman & Co.: New York.
NGO
Non-Governmental Organizations
Paleontological Research Institution
Climate Crisis
The Climate Project
Climate Science Watch
The Climate Institute
Government Organizations
National Oceanic and Atmosphere Administration (NOAA)
National Aeronautics and Space Administration (NASA)
Association of Science and Technology Centers - International Action on Global Warming (ASTC-IGLO)
US Global Change Research Program (USGCRP)
United States Geological Survey (USGS)
International Panel on Climate Change (IPCC)
United Nations Framework Convention on Climate Change (UNFCC-CC)
United States Climate Action Partnership (US-CAP)
Glossary • Resources • Acknowledgements
Paleontological Research Institution • 1259 Trumansburg Road • Ithaca, NY 14850 • 607.273.6623 • www.priweb.org
PALEONTOLOGICAL RESEARCH INSTITUTION
Cornell University
site by outhouse design

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Habitat Loss and Biodiversity

Pre-reading questions:

1. Before you read the text on the impacts of climate change on biodiversity, take a moment and consider what you might know already about the topic. How does climate change threaten biodiversity?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. What are some of the ways in which humans cause the extinction of other species?

4. How does habitat loss due to climate change impact biodiversity?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What categories of African animals are most at risk due to climate change? Explain how you arrived at your answer.

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

PowerPoint

Habitat Destruction: The Idea of Progress

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

- Students will consider the impact of habitat destruction on biodiversity.
- Students will reflect on how perspectives on progress and settlement have changed over time.
- Students will read and analyze visual and print information in diverse texts.
- Students will identify aspects of texts that reveal points of view about human settlement.
- Students will cite specific textual evidence to support analysis of primary and secondary sources.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.C
	LS4.D
C3 Framework Social Studies Concepts	D2.His.5.6-8
	D2.Geo.8.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.1
	CCSS.ELA-LITERACY.RH.6-8.6
	CCSS.ELA-LITERACY.RH.6-8.7

Vocabulary:

progress, settlement, habitat, rainforest, clearcut

Media Type(s): oil painting, Facebook post



American Progress Oil Painting
John Gast, 1872



Where the Wild Things Aren't
Facebook post, Rainforest
Action Network, 2012

Preparation and Materials:
*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use These Materials* section.

Preparation:
- Download and review the *How to Use These Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: Conservation Biology: Habitat Destruction*
- Two-page *Student Worksheet: Habitat Loss and Biodiversity*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Endangered Species – Lesson 1: History of Endangered Species

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Endangered Species – Lesson 1: slides 7, 8, 15, 16, 39
Media Constructions of Resource Depletion – Lesson 1: slides 9, 10, 11, 15, 18, 26, 27, 34, 35, 43, 45, 50

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- In what ways have humans altered the biosphere?
- How has habitat destruction impacted the natural resources that humans use?

Social Studies

- How has habitat destruction impacted migration patterns of people and animals?
- How has the idea of progress changed over time as regards human settlement of wilderness lands?

ELA

- What messages are suggested about human settlement of wilderness lands?
- What evidence do you see in the image to support your analysis?
- What are the symbols representing progress and what do they imply for other living beings?

Media Literacy

- What techniques does the artist use to convey their message?
- Who might benefit from this message and who might be harmed by it?
- When and how was this shared with the public?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?
- What questions do you have about this?

Writing Prompt for Synthesis Assessment in the Sub-Topic, *Habitat Destruction*

Draw evidence from the handout and the images to support or oppose this statement: "Progress in human settlement of the earth has led to a positive outcome for people and the planet."

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested about human settlement of wilderness lands? What evidence do you see in the image to support your analysis?

Possible Answer: Doc 1: Technological progress and settlement of the west is inevitable and divinely sanctioned. Native peoples and animals are destined to retreat before the welcome advance of civilization.
Evidence: Inevitability – the vast array of vehicles and people all moving westward
Divine sanction -the westward movement of the goddess clothed in white, coming from light into darkness and guiding the way west
Destined retreat - animals and native peoples looking over their shoulders and moving into darkness
Doc 2: The destruction of forests is driven by human production demands and results in the ruin of habitats and the disappearance of animal species.
Evidence: Destruction of forests – stacks of felled trees on the ground
Production demands – "turning rainforests into kid's books"
Disappearance of animal species – "Where the Wild Things Aren't" & images of animals with paws raised in distress

Media Literacy

Question: What techniques does the filmmaker use to convey their message?

Possible Answers: Doc #1: The artist employs symbols of progress to illustrate the title to promise of the painting's title message, "American Progress." Symbols of progress include the railroad, covered wagon, stagecoach, plow, split rail fence, log cabin, teams of oxen and horses, the "goddess of progress" with school book and telegraph wire in hand, settlers with gun and pick axe, ships, city and suspension bridge in background.
Doc 2: The artist and designer play on the well-known children's book, "Where the Wild Things Are" by Maurice Sendak to convey the message about a world unlivable for wild things. References to Sendak's book include the mash-up of wild thing characters and the word play on the title. The artist places the Harper Collins logo beneath the woodpile to suggest the burning/transformation of the forests into pulp for children's books.

Question: Who might benefit from this message and who might be harmed by it?

Possible Answers: Doc 1 might benefit the railroad owners, wagon makers and developers who realize wealth from settlers buying and using their products. It might also benefit politicians and others who support the idea of manifest destiny. It might harm native peoples and wildlife populations that are exterminated and displaced in the push for western expansion in the late 19th century when this painting was created.
Doc 2 might benefit the Rainforest Action Network and its allies by raising awareness and political pressure to end the cutting of forests for paper production. It might harm those companies like Harper Collins and the lumber companies who log forests who want to continue extracting trees from the forest to make and sell their products.

gin Not a

The Encyclopedia OF EARTH



Get Involved in Creating EoE Content | Current Members and Authors

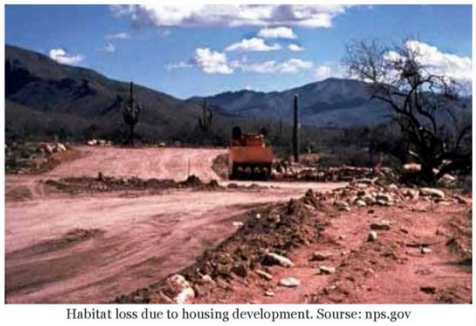
Search This Site

Encyclopedia of Earth Topics
About the EoE
Agricultural & Resource Ec...
Biodiversity
Biology
Zoology
Animal Behavior
Ornithology
Astrobiology
Botany
Conservation Biology
Entomology
Evolutionary Biology
Microbiology
Climate Change
Ecology
Environmental & Earth Science
Energy
Environmental Law & Policy
Environmental Humanities
Food
Forests
Geography
Hazards & Disasters
Health
Mining & Materials
People
Physics & Chemistry
Pollution
Society & Environment
Water
Weather & Climate

Conservation Biology

Habitat destruction

Published: July 22, 2010, 12:00 am
Updated: June 10, 2012, 9:56 pm
Author: C Michael Hogan
Topic Editor: Patricia Gowaty
Topics: Conservation Biology, Ecosystem Services, Biodiversity, More


Habitat loss due to housing development. Sourse: nps.gov


Mass grading for the Panama Canal enlargement project will entirely destroy this island. source: C.Michael Hogan

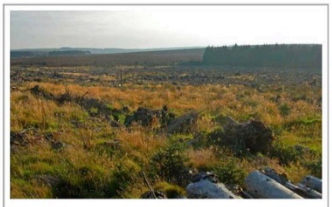
Habitat destruction is the alteration of a natural habitat to the point that it is rendered unfit to support the species dependent upon it as their home territory. Many organisms previously using the area are displaced or destroyed, reducing biodiversity. Modifying habitats for agriculture is the chief cause of such **habitat loss**. Other causes of habitat destruction include surface mining, deforestation, slash-and-burn practices and urban development. Habitat destruction is presently ranked as the most significant cause of species extinction worldwide.[1] Additional causes of habitat destruction include acid rain, water pollution, introduction of alien species, overgrazing and overfishing.

A closely related concept is that of habitat fragmentation, where a habitat is separated into fragments that lack effect ecological connectivity, reducing the viability of some of the resident species. The fundamental driver of habitat destruction has been the unprecented human population explosion, which has been a unique event of a single species dominating natural systems of the Earth within the short time span of 10,000 years. The waves of habitat destruction are closely correlated with the numerical expansion of the human population as well as settlement incursions such as the Maori in New Zealand and the Europeans to North America.

Proximate causes

The chief proximate causes of habitat destruction are:

- Conversion of natural habitat for agricultural use including crops and grazing activity
- Pollution, especially chemical herbicide and pesticide use, water pollution, air pollution and acid rain
- Urban development and infrastructure, including roads, power plants, desert solar arrays, pipelines and transmission lines
- Timber harvesting and slash-and-burn practices leading to deforestation
- Introduction of alien species


Clearfelling of monoculture alien species conifer forest.
Aberdeenshire, Scotland. Source: C.Michael Hogan

Starting in the mid-Holocene and continuing to the present time, agriculture has been the predominant cause of habitat destruction. Conversion of natural habitat to crop production as well as to grazing has eliminated the expanse of much of the Earth's original habitat. For example, in Europe, over 85 percent of all natural habitat has been destroyed, mostly for agricultural practices. In principle, grazing could be consistent with grassland conservation; however, widespread overgrazing practices have resulted in extensive loss of natural habitat.

Pollution compromises and destroys habitats in numerous ways. Acid rain alters the pH of both watercourses as well as soils, thus fundamentally transforming the abiotic integrity of natural habitats. The change in pH levels alters the metabolic capability of both plants and animals, leading to reduced numbers or complete loss of entire species within the affected area. Similarly water pollution can dramatically alter the survival of species within an aquatic habitat. Air pollution impacts include dispersal of oxides of ntirogen and sulfur dioxide, which among other gas contaminants can alter metabolism, fitness and mortality of flora and fauna.



Latvian monocultural agriculture displaced native grassland
and forest: beautiful but ecologically disastrous.
Source: C.Michael Hogan

While urban development represents very visible evidence of habitat destruction, it accounts for far less of the net damage compared to agricultural and deforestation causes. One of the prominent effects of this type of destruction is the habitat fragmentation effects of long linear projects, especially roadways that create permanent barriers to habitat continuity.

Any type of deforestation represents habitat destruction; the most significant forms of this destruction are clearcutting and slash-and-burn agriculture. These two practices are responsible for massive habitat losses in such places as Madagascar, Indonesia and Brazil.

Perhaps the most subtle form of habitat destruction results from invasive species, flora or fauna which generally are introduced by humans and crowd out native species. This phenomenon can occur on such a massive scale and progress sufficiently slowly that a fundamental transformation may occur in the form of relatively modest annual steps. An example of this phenomenon is the destruction of most of the California coastal prairie, resulting from introduction of exotic European and Asian grasses when European settlement began in earnest in the mid 1800s.

The fundamental driver: human overpopulation



Hong Kong has displaced virtually all the original ecosystem
where it stands. Source: C.Michael Hogan

While there are a number of clearly defined processes leading to destruction of habitat, the underlying cause of all these is the human population explosion. Ironically the majority of the human population growth is situated within the greatest biodiversity hotspots. Specific statistical analysis demonstrates that 87.9 percent of varation in species endangerment can be explained by the single variable of human population density.[2] Some researchers like to further break down the pressure of human overpopulation into components of behavior; in one sense this is a distraction from the fundamental reality of the causation. These behaviors and attributes consist of such descriptors as: (a) lack of family planning; (b) lack of secure property rights; (c) famine; (d) poverty and (e) lax enforcement of environmental statutes.

Consequences

Prominent consequences of habitat destruction may include local or global extinction of species and thus biodiversity loss. In a anthropocentric context a major consequence is reduction of ecosystem services or loss of economic value of the environment to humans. Specific elements of these losses include: (a) topsoil erosion; (b) reduction in sustainable yields of fisheries, forests and other biotic resources; (c) loss of pollinators; (d) reduction in water quality due to sedimentation; (e) loss of carbon storage; (f) reduction of surface water resources and (g) loss of genetic materials that provide medicinal value. Reduction of usable water resource is compounded by pollution degradation pollution along with reduced retention of freshwater resources as natural soils and detritus are replaced with less pervious soils and even pavement.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

Without regard to the inestimable value of species lost and aesthetic degradation, the brute economic toll of habitat destruction is massive. Economic losses to fisheries and agricultural productivity equates easily to hundred of billions of dollars (US) per annum. More significantly, the uprooting of food security for hundreds of millions of people is an intrinsic consequence of the topsoil and pollinator losses. The loss of food security is occurring in the very places that habitat losses are currently greatest, and where population growth is the highest, implying a near certainty of increasing famine and warfare in those regions as food and water conflicts exacerbate.

Natural causes

Some natural events such as volcanic eruptions, hurricanes, flooding, forest fires and other disturbances can cause habitat loss; however, these factors produce a very small percentage of the total habitat loss over the past 10,000 years. Furthermore, these natural events can be viewed as elements of ecological succession, that are part of the evolutionary fabric of speciation. More importantly, natural causes tend to produce relatively minor swaths of destruction compared to the systematic destruction of habitat by human activities. For example, volcanic eruptions from K?lauea, one of the world's most active volcanoes, has covered about four square kilometers of land per annum over the last 27 year period of intense eruption; moreover, much of the land covered three decades ago has been substantially recolonized by pioneer vegetation in the cycle that has built this island of Hawaii. By contrast in the central highlands of Madagascar, over a similar time span, slash-and-burn destruction of previous rainforests decimated over 60,000 square kilometers, with the destruction being irreversible, owing to the subsequent loss of topsoil and soil nutrients. Similarly hurricanes and flooding do not destroy a total habitat, but cause disruption which can be viewed as a natural cycle of nature, which has endured for hundreds of thousands of years within the context of ecosystems which have persisted over that time..

The future

The outlook for halting habitat destruction is not favorable when viewed on a worldwide basis. A number of countries, such as the USA, Canada, Belize, Botswana, Israel, United Kingdom, Sweden, New Zealand and Australia, have advanced efforts for analysis of habitat values and national programs for protection of natural areas. Developing countries including China, Pakistan, Indonesia, Cambodia, Venezuela and most of Africa have substantial deficiencies in food production, and hence are under great pressure to exploit remaining natural areas for subsistence agriculture as well as cash crops. Approximately 98 percent of the usable agricultural area of the Earth has already been developed,[7] so that enormous pressure will exist in the next four decades as the human population is expected to expand by antoher three billion people.

References

1. ^ Stuart L.Pimm and Peter Raven. 2000. *Biodiversity: Extinction by numbers*. Nature **403:** 843-845
2. ^ J.K. McKee, P.W. Sciulli, C. D. Fooce, and T. A. Waite. 2003. *Forecasting global biodiversity threats associated with human population growth*. Biological Conservation 115: 161-164
3. ^ Sharon L.Spray and Matthew David Moran. 2006.*Tropical deforestation*. 193 pages
4. ^ Masae Shiyomi and Hiroshi Koizumi. 2001. *Structure and function in agroecosystem design and management*. 435 pages
5. ^ M.Gerardo, E.Perillo, Eric Wolanski, Donald R. Cahoon and Mark M.Brinson. 2009. *Coastal wetlands: an integrated ecosystem approach*. 704 pages
6. ^ Gordon L.Maclean. 1996. *Ecophysiology of desert birds*. 683 pages
7. ^ E.W.Sanderson, M. Jaiteh, M. A. Levy, K. H. Redford, A. V. Wannebo, and G. Woolmer. 2002. *The human footprint and the last of the wild*. Bioscience 52(10): 891-904.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Habitat loss and Biodiversity

Pre-reading questions:

1. Before you read the text on habitat destruction, take a moment and consider what you might know already about the topic. What are some causes and effects of habitat loss?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. What are the main causes of habitat loss?

4. What are some consequences of habitat loss?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What is the outlook for stopping habitat loss in the future?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

PowerPoint

Invasive Species: How Do We Stop an Invasion?

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

- Students will consider the impact of the introduction of invasive species on an ecosystem.
- Students will reflect on the advantages of different strategies to halt the spread of invasive species.
- Students will read and analyze visual and print information in diverse texts.
- Students will identify aspects of texts that reveal perspectives about how to stop invasive species.
- Students will integrate information expressed in words in a text with a version of that information expressed visually in a graph or a collage.

Standards Options	
Next Generation Science Disciplinary Core Ideas	LS2.A
	LS4.D
C3 Framework Social Studies Concepts	D2.Geo.5.6-8
	D4.7.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.1
	CCSS.ELA-LITERACY.RH.6-8.6
	CCSS.ELA-LITERACY.RST.6-8.7

Vocabulary:

invasive species, ecosystem, habitat, eradication

Media Type(s): poster, webpage



Invasion of the Habitat Snatchers Poster, Virginia Invasive Species Working Group, 2010



Early Detection is the Key webpage, Clackamas Soil and Water Conservation District, 2015

Preparation and Materials:
*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use These Materials* section.

Preparation:
- Download and review the *How to Use These Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: Invasive Species*
- Two-page *Student Worksheet: Stop the Spread of Invasive Species*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Endangered Species – Lesson 1: History of Endangered Species

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Endangered Species – Lesson 1: Slides 27, 28

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- What are some classes of living organisms that are considered invasive species?
- What are some impacts of invasive species?

Social Studies

- How do invasive species change the environments they enter?
- What are some strategies to address problems caused by the introduction of invasive species?

ELA

- What messages are suggested about invasive species?
- What evidence do you see in the image to support your analysis?

Media Literacy

- Who is the target audience of this media message? How do you know?
- What techniques were used to communicate the producer's message?
- What kinds of actions might I take in response to this message?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?
- What questions do you have about this?

Writing Prompt for Synthesis Assessment in the Sub-Topic, *Invasive Species*

Draw evidence from the handout and the images to write about how and why environmental protection advocates try to persuade people to help stop the spread of invasive species.

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested about invasive species?
What evidence do you see in the image to support your analysis?

Possible Answer: Doc 1: Invasive species are dangerous and must be kept from spreading.
Evidence: Dangerous – "Invasion of the Habitat Snatchers" and image of crayfish with pincers extended toward the viewer. Must be stopped – "Coming soon to a natural area near you" and "needs your help to stop the spread."
Doc 2: Invasive species can be stopped only when eradication efforts begin early.
Evidence: Title- "Early detection is the key." Text – "Important to stop new outbreaks before they start." Graph – Shows control costs rising and effectiveness reducing as length of invasion persists.

Media Literacy

Question: Who is the target audience of this media message? How do you know?

Possible Answers: Doc 1 is targeted at the general public who might visit a Virginia park and see this poster which might remind them of a science fiction film poster.
Doc 2 is targeted at individuals who have a special interest in soil and water conservation in the area of Clackamas County (Oregon) since it's likely that visitors to this web page would be looking for information specific to the locale and mission of the sponsoring organization.

Question: What techniques were used to communicate the producer's message?

Possible Answers: Doc 1 uses the theme of a science fiction movie poster to make its point, borrowing from the film "Invasion of the Body Snatchers" and using the phrase "Coming soon to a natural area near you."
Doc 2 uses color and visual suggestion in the graph to persuade viewers of the urgency of stopping the spread of invasive species. The color rises from a calm and environmentally friendly shade of green at the bottom when prevention is easier to a bright emergency red at the top when costs are out of control and only local controls might work. The visual suggestion of the graph is of a wave cresting and overwhelming the environment if early detection and preventative actions are not undertaken.

Question: What kinds of actions might I take in response to this message?

Possible Answers: Doc 1 People might go to the website or research on their own to learn more about invasive species. They might seek help from their local cooperative extension office to find out which invasive species might be of concern in their area. They might talk to others about the spread of this problem.
Doc 2 People might contact their own soil and water conservation district headquarters to see what they've done about this issue. They might contact local schools or universities to see what education is being done in their local and regional area about invasive species threats. They might start their own informal education campaign to encourage others to begin looking for and eradicating invasive species.

NWF ADOPT SHOP KIDS

NATIONAL WILDLIFE FEDERATION

DONATE TAKE ACTION

WHO WE ARE | WHAT WE DO | WHERE WE WORK | HOW TO HELP | NEWS & BLOGS | PHOTOS | WILDLIFE



Wildlife

- Wildlife Library
- Wild Places
- Wildlife Conservation
- Threats to Wildlife
- Global Warming
- Habitat Loss
- Invasive Species
- Invasive Mussels
- Stink Bugs
- Overexploitation
- Pollutants
- Disease
- National Wildlife Week
- Adopt an Animal
- Speak up for Wildlife
- Garden for Wildlife
- Adopt a Wildlife Acre

Make a Difference

- Donate
- Shop
- Renew
- Adopt
- Leave a Legacy

Invasive Species

Forward

"Invasive species" — it doesn't sound very threatening, does it? But these invaders, large and small, have devastating effects on U.S. wildlife. **Invasive species are one of the leading threats to native wildlife.** Approximately 42% of Threatened or Endangered species are at risk primarily due to invasive species.

Human health and economies are also at risk from invasive species. The impacts of invasive species on our natural ecosystems and economy cost billions of dollars each year. Many of our commercial, agricultural, and recreational activities depend on healthy native ecosystems.

What makes a species invasive?



An invasive species can be any kind of living organism—an amphibian (like the cane toad pictured left), plant, insect, fish, fungus, bacteria, or even an organism's seeds or eggs—that is not native to an ecosystem and which causes harm. They can harm the environment, the economy or even, human health. Species that grow and reproduce quickly, and spread aggressively, with potential to cause harm, are given the label of "invasive".

An invasive species does not have to come from another country. For example, lake trout are native to the Great Lakes, but are considered to be an invasive species in Yellowstone Lake in Wyoming because they compete with native cutthroat trout for habitat.

How do invasive species spread?

Invasive species are primarily spread by human activities, often unintentionally. People, and the goods we use, travel around the world very quickly, and they often carry uninvited species with them.

- **Ships**: Ships can carry aquatic organisms in their ballast water.
- **Wood products**: Insects can get into wood, shipping palettes and crates that are shipped around the world.
- **Ornamental plants**: Some ornamental plants can escape into the wild and become invasive.
- **Pet trade**: Some invasive species are intentionally or accidentally released pets. Burmese pythons are becoming a big problem in the Everglades.

Why do invasive species pose such a threat?

Invasive species cause harm to wildlife in many ways. When a new and aggressive species is introduced into an ecosystem, it might not have any natural predators or controls. It can breed and spread quickly, taking over an area. Native wildlife may not have evolved defenses against the invader or they cannot compete with a species that has no predators.

The direct threats of invasive species:

- **preying** on native species
- **out-competing** native species for food or other resources
- causing or carrying **disease**
- **preventing native species from reproducing** or killing their young

The indirect threats of invasive species:

- **Changing food webs**: Invasive species can change the food web in an ecosystem by destroying or replacing native food sources. The invasive species may provide little to no food value for wildlife.
- **Decreasing biodiversity**: Invasive species can alter the abundance or diversity of species that are important habitat for native wildlife. Aggressive plant species like kudzu can quickly replace a diverse ecosystem with a monoculture of just kudzu.

JOIN NWF ON:

GET OUR E-NEWSLETTER

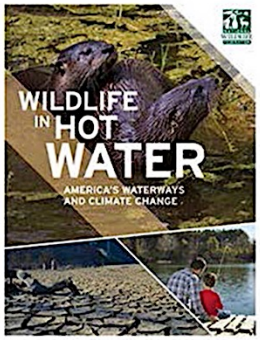
Featured Action



Speak Out for Monarch Butterflies

Take Action >>

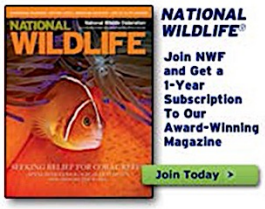
NWF Reports



Wildlife in Hot Water: America's Waterways and Climate Change

Additional Reports:

- *Wildlife in a Warming World*
- *Swimming Upstream: Freshwater Fish in a Warming World*
- *Shifting Skies: Migratory Birds in a Warming World*
- *Big Game Wildlife in a Warming World*



Connecting...

Examples of invasive species

There are unfortunately many examples of invasive species invasions across the United States. Here are just a few:



- **Asian carp** —a catchall title for species of silver, bighead and black carp from Asia—are a fast-growing fish that out-compete native fish for food and habitat.
- **Brown marmorated stink bugs** have become an increasing nuisance in homes and to the agriculture industry. Away from their natural predators, stink bug populations are expanding rapidly.
- **West Nile virus**, spread by mosquitoes infected with the virus, is an invasive pathogen that has caused direct harm to humans (sometimes resulting in death) as well as to wildlife (especially birds). It has been detected throughout most of the continental United States.
- **Cogongrass** is an Asian plant that arrived in the U.S. as seeds in packing material. It is now spreading through the Southeast, displacing native plants. It provides no food value for native wildlife, and increases the threat of wildfire as it burns hotter and faster than native grasses.
- **Feral pigs** will eat almost anything, including native birds. They compete with native wildlife for food sources such as acorns. Feral pigs spread diseases, such as brucellosis, to people and livestock. E. coli from their feces was implicated in the E. coli contamination of baby spinach in 2006.
- **Zebra mussels** first came to the U.S. from Eurasia in ship ballast water released into the Great Lakes. Since 1988, they have spread dramatically, out-competing native species for food and habitat. Zebra mussels can attach to almost any hard surface - they clog water intake and discharge pipes, attach themselves to boat hulls and docks, and they even attach to native mussels and crayfish.
- **European green crabs** found their way into the San Francisco Bay area in 1989. They out-compete native species for food and habitat and eat huge quantities of native shellfish, threatening commercial fisheries.
- **Dutch elm disease** (caused by the fungus *Ophiostoma ulmi*) is transmitted to trees by elm bark beetles. Since 1930, the disease has spread from Ohio through most of the country, killing over half of the elm trees in the northern U.S.
- **Water hyacinth** is a beautiful aquatic plant, introduced to the U.S. from South America as an ornamental. In the wild, it forms dense mats, reducing sunlight for submerged plants and aquatic organisms, crowding out native aquatic plants and clogging waterways and intake pipes.

Invasive species and global warming

Higher average temperatures and changes in rain and snow patterns caused by global warming will enable some invasive plant species—such as garlic mustard, kudzu and purple loosestrife—to move into new areas. Insect pest infestations will be more severe as pests such as mountain pine beetle are able to take advantage of drought-weakened plants.

What you can do to help curb the spread of invasive species

- **Plant native plants and remove any invasive plants in your garden.** There are many good native plant alternatives to common exotic ornamental plants.
- **Learn to identify** invasive species in your area. **Report any sightings** to your county extension agent or local land manager. Learn more about invasive species in your state.
- **Regularly clean** your boots, gear, boat, tires and any other equipment you use outdoors to remove insects and plant parts that may spread invasive species to new places.
- When camping, **buy firewood near your campsite** (within 30 miles) instead of bringing your own from home, and leave any extra for the next campers. Invertebrates and plants can easily hitch a ride on firewood you haul to or from a campsite -- you could inadvertently introduce an invasive to a new area.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

National Wildlife Magazine Articles:

A Plague of Aliens

Exotic Species - Nutria

Asian Longhorn Beetles

Good Bugs Gone Bad

Resources:

National Environmental Coalition on Invasive Species

Ecosystem Shock-The Devastating Impacts of Invasive Species on the Great Lakes Food Web

USDA Invasive Species Information Center

UGA Center for Invasive Species and Ecosystem Health

Sources:

USDA Invasive Species Information Center

UGA Center for Invasive Species and Ecosystem Health

The National Invasive Species Council - Invasive Species Definition Clarification and Guidance White Paper

USFWS Environmental Contaminants Program – Invasive Species

USFWS - What's the Problem with Invasive Plants?

Donate | Shop | Magazines | Action Center | About Us | E-Newsletter | Contact Us | Careers | Kids



Fun Things:
Activity Finder
Animal Games
Wildlife Library
Wildlife Watch

Helping Wildlife:
Join NWF
Renew Membership
Take Action
Garden for Wildlife
Adopt an Animal
Green Your School

Magazines:
Ranger Rick
Ranger Rick Jr.
National Wildlife

Wildlife News:
Wildlife Promise Blog
Media Center

Connect with NWF
Facebook
Twitter
Google+
YouTube
Pinterest

Wildlife Photos:
Photo Contest
Kids Photo Contest
Caption Contest
Flickr Groups

© 1996-2016 National Wildlife Federation | PO Box 1583, Merrifield VA 22116-1583
1-800-822-9919 (M-F 8 a.m. - 8 p.m. EST)
National Wildlife Federation is a 501(c)(3) non-profit organization
Privacy Policy | Terms of Use | Site Map | Contact Us

PHILANTHROPEDIA COME TOGETHER. GIVE BETTER.
A Division of GUIDESTAR
2009 - 2015 Top Non-Profit

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Stop the Spread of Invasive Species

Pre-reading questions:

1. Before you read the text on habitat invasive, take a moment and consider what you might know already about the topic. What makes a species invasive?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. What are the main impacts of invasive species?

4. How do invasive species spread?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What can people do to stop the spread of invasive species?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

PowerPoint

Pollution: Industrial restoration or destruction

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

- Students will consider the impact of industrial pollution on ecosystem relationships.
- Students will reflect on how the economics of oil production influences the local environment.
- Students will read and analyze visual and print information in diverse texts.
- Students will identify aspects of texts that reveal points of view about pollution abatement.
- Students will integrate information expressed in words in a text with a version of that information expressed visually in a table or a collage.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.C
	ETS1.B
C3 Framework Social Studies Concepts	D2.Geo.4.6-8
	D4.7.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.1
	CCSS.ELA-LITERACY.RH.6-8.6
	CCSS.ELA-LITERACY.RST.6-8.7

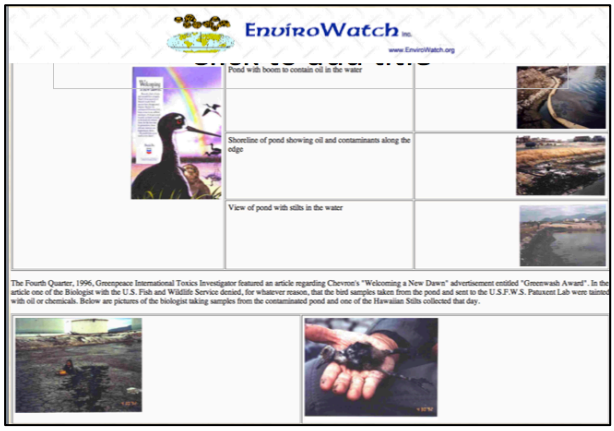
Vocabulary:

endangered species, Hawaiian stilt, oil refinery, contaminant, pollution

Media Type(s): magazine advertisement, webpage



Welcoming a New Dawn Advertisement, Chevron, 1996



Chevron's New Dawn Advertising Campaign webpage, EnviroWatch, 2008

Preparation and Materials:
*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use These Materials* section.

Preparation:
- Download and review the *How to Use These Materials* section associated with this kit.

Materials for the Lesson:
- Two-page *Student Handout: Toxics and Endangered Species*
- Two-page *Student Worksheet: Pollution Endangers Wildlife*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Endangered Species – Lesson 1: History of Endangered Species

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Endangered Species – Lesson 1: Slides 29, 30, 49
Media Constructions of Endangered Species – Lesson 5: Frogs and Atrazine
Media Constructions of Chemicals in the Environment – Lesson 1: Slides 11-13, 27, 28, 46, 49

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- How is the Hawaiian stilt impacted by oil refining processes?
- How could one evaluate the effectiveness of oil refinery ponds in supporting species recovery for the endangered Hawaiian stilt?

Social Studies

- How has the decision to site an oil refinery in Hawaiian stilt habitat impacted the local environment?
- What actions have people taken to call attention to the challenges facing Hawaiian stilt species survival? Which actions seem most likely to result in a positive outcome and why?

ELA

- What messages are suggested about the role of Chevron in supporting Hawaiian stilt species survival?
- What evidence do you see in the image to support your analysis?
- How do the visual images support the message in the written text?

Media Literacy

- Who might benefit from this message and who might be harmed by it?
- What is the mission of the group that produced this message and how does the mission inform the message?
- How credible is this source and why do you think that?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?
- What questions do you have about this?

Writing Prompt for Synthesis Assessment in the Sub-Topic, *Pollution*

Draw evidence from the handout and the images to support or oppose this statement: "Industry should not be allowed to impact wildlife habitat in any circumstance."

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested about the role of Chevron in supporting Hawaiian stilt species survival? What evidence do you see in the image to support your analysis? How do the visual images support the message in the written text?

Possible Answer: Doc 1: Chevron is helping the stilt to recover from unspecified threats.
Evidence: Chevron's role in environmental protection is suggested by the image of a mother bird and chick, a pair of stilts and one taking off into a rainbow covered dawn. Chevron associates itself with this message in the sidebar with the accentuated text: "Welcoming a new dawn", "People do" and the Chevron logo. The ad text implies that Chevron refinery ponds provide habitat by saying "an unlikely sanctuary. A six-acre pond located, curiously enough, in the heart of a refinery."
Doc 2: Chevron refinery ponds contain oil that harms stilts. Chevron is not honest about the destructive role its ponds play in stilt habitat.
Evidence: The page suggests that the ponds harm stilts by showing photos of blackened ponds and an oil covered bird body, identified as the carcass of a stilt. Chevron's dishonesty is highlighted by juxtaposing its "New Dawn" advertisement with the images of the oil saturated ponds and the dead bird and by the text reference to Greenpeace's "Greenwash award" implying that Chevron is trying to make its actions appear "green" to sell its products.

Media Literacy

Question: Who might benefit from this message and who might be harmed by it?

Possible Answers: Doc 1 might benefit Chevron if people buy its products on the assumption that the corporation supports environmental stewardship. It might harm the efforts of people trying to hold corporations accountable for environmental wrongdoing by suggesting that their allegations are unwarranted.
Doc 2 might benefit EnviroWatch, Greenpeace and other environmental groups that try to expose corporate environmental crimes by lending credibility to their accusations. It might harm Chevron and other corporations by holding them accountable for their actions and for cover-ups related to environmental offenses.

Question: What is the mission of the group that produced this message and how does the mission inform the message? NOTE: Possible answers based on brief online research.

Possible Answers: Doc 1 was produced by the Chevron Corporation which says on its Corporate Responsibility-Environment webpage, "protecting people and the environment can go hand in hand with meeting the world's energy needs." The "New Dawn" advertisement suggests that the corporation is protecting the environment by helping Hawaiian stilts recover from species destruction.
Doc 2 was produced by the non-profit organization EnviroWatch which says its mission is "to assist you in putting an end to environmental injustice by way of investigating and exposing environmental degradation, habitat destruction, poaching, clear cutting, pollution, animal cruelty, and government waste and abuse." Their webpage on Chevron's "New Dawn" campaign is an effort to expose what they see as "environmental injustice" on the part of both Chevron and the U.S. Fish and Wildlife Service, an agency that they accuse of lying about samples tested at their laboratory.

donate sign up for e-network site search Google™ Custom Searc

CENTER for BIOLOGICAL DIVERSITY Because life is good.

ABOUT ACTION PROGRAMS SPECIES NEWSROOM PUBLICATIONS SUPPORT



HOME > CAMPAIGNS > TOXICS AND ENDANGERED SPECIES > TOXICS AND ENDANGERED SPECIES

TOXICS AND ENDANGERED SPECIES

The industrial age has brought millions of pounds of toxic contaminants into our environment. Pollution, synthetic chemicals, pesticides, heavy metals and even chemicals from household products are now pervasive in our water, air and soil. This toxic legacy poisons wildlife and our future.

Widespread toxic contamination of ecosystems and exposure to wildlife is well documented. A 10-year government study revealed that more than 90 percent of the nation's tested waters and fish are contaminated with pesticides. These chemicals also make their way into people's water supplies, significantly affecting our health. Independent research has found more than 200 chemicals, many of them known toxins, in the blood of newborns. In both humans and animals — including the California condor, green sturgeon, Tehachapi slender salamander and polar bear — toxic chemicals increase cancer rates, cause reproductive problems and contribute to a wide range of other health problems.

OUR CAMPAIGN

The Center's Toxics and Endangered Species Campaign employs a broad range of tools to reduce the harmful impacts of toxic contamination from pesticides, endocrine disruptors, lead, mercury, coal, uranium mining and fracking. Through strategic litigation, creative media, policy advocacy, scientific reports, coalition building and outreach to our members, the Center has mounted an effective campaign to target some of the most harmful toxins in our environment.

Pesticides

Pesticides, by design, are toxic to plants and wildlife. Their use, degradation and mixtures in the environment have resulted in pervasive water-quality contamination. The Center's Pesticides Reduction Campaign aims to secure programmatic changes in the pesticide registration process and stop toxic pesticides from getting into fish and wildlife habitats.

Toxic contamination of polar bears is a good example of how pervasive pesticide pollution has become. Pesticides approved for use and applied in the continental United States are transported in the atmosphere, in the ocean and along biological pathways, eventually ending up in the Arctic, where they endanger the health of the entire ecosystem.

Endocrine Disruptors

Endocrine disruptors are chemicals that interfere with natural hormone functions and affect the reproduction, development and growth of fish and wildlife, as well as people. Pesticides, pharmaceuticals, plasticizers, cleaning agents, cosmetics, antibiotics and drugs introduced into waterways and aquatic habitats act as endocrine disruptors. As drinking-water sources and aquatic wildlife habitats are being increasingly and unnecessarily contaminated by endocrine disruptors, the effects on imperiled species are profound. The Center continues our campaign to control endocrine disruptors and reduce their impacts on our environment.

Get the latest on our work for biodiversity and learn how to help in our free weekly e-newsletter.

Enter email address

JOIN EMAIL LIST

IN THE SPOTLIGHT

Learn how to reduce toxins in your own home to protect imperiled species.

RELATED CAMPAIGNS

- Pesticides Reduction
- Endocrine Disruptors
- Get the Lead Out
- Coal
- Grand Canyon Uranium Mining
- Protecting Bay Area Species From Toxic Pesticides
- Saving Polar Bears From Poisonous Pesticides
- San Francisco Bay Area and Delta Protection

+ DOCUMENTS AND PUBLICATIONS

+ MEDIA

MAPS

Pesticide Applications

Lead

Lead is still entering the food chain through widespread use of lead hunting ammunition and fishing tackle, poisoning wildlife and even threatening human health. The Center's national Get the Lead Out campaign is devoted to replacing lead-based ammunition and fishing tackle with safer, nontoxic alternatives.

We also work to clean up historic lead pollution. Lead-based paint at federal facilities on Midway Atoll kills up to 10,000 Laysan albatross chicks each year and also threatens the endangered Laysan duck. As a result of a settlement with the Center, the U.S. Fish and Wildlife Service announced a plan to clean up this toxic lead contamination to protect wildlife in the northwestern Hawaiian Islands.

Detrimental to the California Tiger Salamander

Overlap of Florida manatee critical Habitat and watersheds found to contain toxic chemicals

Contact: Jonathan Evans

Mercury

Two-thirds of the toxic mercury in our oceans is a result of manmade pollution from metal production, pulp industries, waste handling and coal production.

The Center is also seeking innovative ways to reduce mercury exposure and increase awareness of mercury contamination. The primary source of mercury exposure for humans in the United States is contaminated seafood, and one-third of mercury exposure comes from consumption of tuna. The Center has petitioned the U.S. Food and Drug Administration to implement stricter regulations to protect women, children and all people who eat fish from mercury in seafood.

Past mercury use has left a toxic legacy that can be resurrected through modern mining practices. Suction dredge mining in waterways not only directly hurts habitat for sensitive, threatened and endangered fish and frogs, but can also pollute waterways with toxic plumes of mercury leftover from the Gold Rush. The Center has worked through litigation and legislation to ban suction dredge mining in California.

Coal

In addition to the direct physical impacts of coal mining itself, there are severe toxic impacts of air pollution from coal-fired power plants, the waste from coal-mining tailings and coal ash slurry. The Center's campaign to fight the harmful effects of coal energy takes on these threats.

Coal combustion produces a number of hazardous byproducts, including mercury, selenium, CO_2, nitrogen dioxide, sulfur dioxide and methane — which pollute the environment, exacerbate climate change and contribute to smog and acid rain. The Center, along with a coalition of environmental groups, filed a formal petition with the U.S. Environmental Protection Agency to establish, for the first time ever, limits on air pollution from coal mines throughout the United States. The Center has also worked to challenge individual coal production plants that pose particular threats to wildlife and ecosystems.

Mountaintop-removal coal mining is exceptionally devastating to ecosystems and wildlife. The toxins from mining wash downstream, poisoning animals that manage to survive in the toxic environment and tainting the drinking water of downstream communities.

Uranium

Uranium mining has left a toxic and radioactive footprint across many areas of the West. All phases of uranium development — exploration, mining, milling and disposal — pose unique threats to species, ecosystems and human communities. Uranium ends up in the food chain and causes irreversible pollution of waters. It can contaminate aquatic ecosystems for hundreds of years, threatening downstream communities and fish and wildlife. Even minute amounts of uranium can poison fish, accumulate in the food chain, and cause deformities and reproductive problems for aquatic species.

The Center is engaged in a broad based campaign to fight uranium mining on our public lands and to limit uranium's toxic legacy, including our campaign to stop Grand Canyon uranium mining.

Fracking

Fossil-fuel drilling involving high-pressure hydraulic fracturing, or "fracking," is a highly controversial and dangerous oil-drilling method linked to water contamination and methane production. Recent reports show that fracking has resulted in more than 1,000 documented cases of groundwater contamination, either through the leaking of fracking fluids and methane into groundwater or from aboveground spills of contaminated wastewater. The Center has worked to fight fracking in California to protect watersheds and wildlife.

Tehachapi slender salamander photo © Gary Nafis, www.californiaherps.com

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Pollution Endangers Wildlife

Pre-reading questions:

1. Before you read the text on the effects of pollution on endangered species, take a moment and consider what you might know already about the topic. How are animals endangered by chemical pollution?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. What are the some of the most harmful toxins or poisons in our environment?

4. How do chemicals endanger wildlife?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What can people do to reduce the harmful impacts of chemical pollution of the environment?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. There are no references for this reading. How does the lack of references affect your rating of the credibility of the overall web page?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

PPT
PowerPoint

Trophy Hunting: Conservation or Destruction?

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

- Students will consider the impact of trophy hunting on animal species.
- Students will reflect on how the economics of trophy hunting affect wildlife and human society.
- Students will read and analyze visual and print information in diverse texts.
- Students will identify aspects of texts that reveal points of view about trophy hunting.
- Students will cite specific textual evidence to support analysis of secondary sources.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.C
	LS2.A
C3 Framework Social Studies Concepts	D2.Eco.1.6-8
	D4.6.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.1
	CCSS.ELA-LITERACY.RH.6-8.6
	CCSS.ELA-LITERACY.WHST.6-8.1A

Vocabulary:

Endangered species, trophy hunting, conservation

Media Type(s): poster, webpage



What are You Really Bringing Back with You? Poster, International Fund for Animal Welfare, 2007



Killing in the Name of Conservation webpage, The Breakthrough, 2015

Preparation and Materials:
*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use These Materials* section.

Preparation:
- Download and review the *How to Use These Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: US Carnivore Hunting Policies Are Scientifically Lacking*
- Two-page *Student Worksheet: The Science of Carnivore Hunting*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Endangered Species – Lesson 1: History of Endangered Species

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Endangered Species – Lesson 1: Slides 9, 33-36, 43
Media Constructions of Endangered Species – Lesson 2: Northern Rockies Grey Wolf

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- What impact does wildlife hunting have on prey populations?
- Does hunting support ecosystem resilience? Why or why not?

Social Studies

- How has trophy hunting for profit affected the well-being of humans and wildlife?
- How has the debate about trophy hunting impacted local and global populations?

ELA

- What messages are suggested about trophy hunting?
- What evidence do you see in the image and the text to support your analysis?
- What is the suggested meaning of the title?

Media Literacy

- Who might benefit from this message and who might be harmed by it?
- What is the mission of the group that produced this message and how does the mission inform the message?
- What kinds of actions might I take in response to this message?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?
- What questions do you have about this?

Writing Prompt for Synthesis Assessment in the Sub-Topic, *Trophy Hunting*

Draw evidence from the handout and the images to support or oppose this statement: "Trophy hunting can help conserve African wildlife."

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested about trophy hunting?
What evidence do you see in the image and the text to support your analysis?

Possible Answer: Doc 1: Trophy hunting threatens the existence of endangered species.
Evidence: The text challenges the reader to "think twice" about what they are "really bringing back" and the image of the animals on the luggage carrousel is unexpected and jarring. This image is an attempt to use irony as a means to expose the ways in which materialism and consumerism threaten the effort to protect endangered species.
Doc 2: When practiced carefully trophy hunting can contribute to species conservation.
Evidence: Can contribute: "Arguing that trophy hunting is an act of conservation." "Some conservationists …see evidence for her thesis." "Trophy hunting can contribute to conservation." Practiced carefully: "The challenge…is to formulate a baseline for judging." "How fragile the balance between conflicting goals and ideas can be." The message behind the image of a hunter smiling next to an antelope he has presumably killed does not take a position one way or another about the business of trophy hunting.

Question: What is the suggested meaning of the title?

Possible Answer: Doc 1: The title implies that tourists returning to Africa may inadvertently buy and bring home souvenirs made from endangered species.
Doc 2: The title implies that hunting can be an act of conservation.

Media Literacy

Question: Who might benefit from this message and who might be harmed by it?

Possible Answers: Doc 1 might benefit the International Fund for Animal Welfare, the group who produced the poster, by drawing interest and perhaps contributions to their group. It might also benefit other anti-hunting campaigns that are working toward similar ends. It might harm the hunting and souvenir market in Africa if enough tourists refrain from buying goods or services that might be associated with hunting African wildlife.
Doc 2 might benefit the African hunting industry by encouraging prospective clients to consider hunting African wildlife as an act of conservation. It might harm groups like IFAW and their supporters who intend to discourage hunting and the buying of souvenirs that may be made from African wildlife.

Question: What is the mission of the group that produced this message and how does the mission inform the message? NOTE: Possible answers based on brief online research.

Possible Answers: Doc 1 was produced by the International Fund for Animal Welfare which says its mission is "to rescue and protect animals around the world." The poster discourages the killing of African wildlife and thus is consistent with its mission to protect animals.
Doc 2 was produced by the Breakthrough Institute whose mission is "to accelerate the transition to a future where all the world's inhabitants can enjoy secure, free, prosperous, and fulfilling lives on an ecologically vibrant planet." The webpage encourages thoughtful discussion about the ways in which controlled hunting could be a means to conserve African wildlife and to support people who live near those wildlife habitats and is consistent with its mission to support both human and wild communities.

UNIVERSITY of WASHINGTON
Conservation
THE SOURCE FOR ENVIRONMENTAL INTELLIGENCE
DONATE

Home | Conservation This Week

US carnivore hunting policies are scientifically lacking



US CARNIVORE HUNTING POLICIES ARE SCIENTIFICALLY LACKING

December 18, 2015 | *Conservation This Week* | *2 Comment*

By now you probably know the arguments for the monitored, controlled, legalized forms of wildlife hunting. It has the potential to reduce conflict with humans and can provide much-needed revenue to be put toward conservation efforts. But not all populations are created equal; applied to the wrong ecosystem, hunting can also drive population declines, the echoes of which will reverberate throughout its landscape. In this week's issue of *Science Magazine*, a group of researchers led by Montana State University wildlife biologist Scott Creel argue that wolf hunting policies in the US don't align with the best evidence that science has to offer.

Sign Up for Our Newsletter

Weekly Dispatch: a survey of new conservation science (sample)

email address

Submit

News



What's happening with the magazine's reinvention?

Conservation Archive

After wolves were reintroduced to the Northern Rocky Mountains (NRM) in the mid-1990s, the carnivore population grew stronger. But that trend stopped in 2009. That's because in 2008, the population lost its protection under the ESA and hunting became legalized.

Reviews by the USFWS say that hunting "has not increased any risk" to the NRM wolf population, but Creel and his colleagues aren't so sure. "Current policies state that half of a wolf population can be shot annually without causing the population to decline," said Creel in an official statement. "On the basis of ecological theory, this suggestion is not likely to be correct for the wolf, or indeed for any large carnivore."

Fully-grown, mature large carnivores usually have low mortality rates. They are the kings of their jungles, after all. Hunting doesn't substitute for other causes of wolf death, as is more likely the case for ungulates like deer. For animals like wolves, hunting pressures instead add to the mortality rate. After hunting was legalized in Montana and Idaho in 2008, wolf pack size there declined by nearly a third. And hunting doesn't just impact group size – it also affects a group's social order, which impacts the likelihood that juveniles will grow to reproductive age. Indeed, in 2013, five years after hunting was legalized, hunters took 25% fewer wolves – despite an extended hunting season!

How can the scientific evidence and the USFWS review be so contradictory? Creel's group suggests that there can be a mismatch between the animals that provide the data to inform policy decisions and the animals to which that policy applies. "Carnivore distributions do not follow political borders, but hunting policies do," they say. Just because the overall Northern Rocky Mountains population has been relatively stable under pressure from hunting doesn't mean that the packs in any given state are equally so. Idaho's annual wolf counts declined by nearly a quarter between 2008 and 2013.

More importantly, Creel's group says the studies on which the USFWS based their review focused on wolf populations that could recruit immigrant wolves from other, nearby populations. Those local losses to hunting could be replaced by the influx of new individuals from elsewhere. It's not that wolves are able to compensate for local losses, but it might appear that way if you're not looking very closely. By analogy, while African lions may be protected within national parks, legalized hunting just outside of parks can still destabilize the overall lion population. Harvesting lions outside of parks creates a "vacuum," drawing in the otherwise protected lions from inside of parks – leaving them vulnerable to hunting.



Explore Conservation magazine's 15-year archive >

WRITERS

Fred Pearce
How Beer Money Can Help Save a Nation's Water Supply TV as Birth Control Logging by Number

Gaia Vince
DIY Glaciers Hungry for Land

Richard Conniff
10 Ways Microbes Can Save the World Dysfunctional Nations, Rising Cities The Fish Oil Catch

Brandon Keim
Add a Few Species. Pull Down the Fences. Step Back.

Dawn Stover
You Pay or We Drill Not So Silent Spring Troubled

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

There can be a sustainable way forward for carnivore hunting. The future of wildlife management in most parts of the world probably includes at least some carefully controlled harvest. But if legalized hunting is to occur, the researchers say that policies need to be based on rigorous, empirical science, which requires "clearly defined, quantitative" goals.

Current wolf hunting policies in the NRM simply aim to avoid a population crash so severe that it would require re-listing under the ESA, but that's too hand-wavy a target. Instead, policies should specify things like maximum harvest rates or goals for population size or growth from year to year. According to Creel, "the North American model of wildlife management works very well for species like ducks or elk, but becomes much more complex for species like wolves that compete with hunters." – **Jason G. Goldman | 18 December 2015**

Source: Creel, S., Becker, M., Christianson, D., Dröge, E., Hammerschlag, N., Haward, M.W., Karanth, U., Loveridge, A., Macdonald, D.W., Wigganson, M., M'soka, J., Murray, D, Rosenblatt, E, Schuette, P. (2015) Questionable policy for large carnivore hunting. Science. DOI: 10.1126/science.aac4768.

Header image: shutterstock.com

Print Friendly

Tags: *hunting*, *wolves*

James McWilliams
The Ecological Creed of Craft Beer The Crooked Path from Farm to Fork Fertility Treatments

Bill Chameides
The Artful Planet

Carl Zimmer
The Most Popular Lifestyle on Earth Black is the New Green

Paul Salopek
Closed-Source Crops

Burhard Bilger
To Build a (Better) Fire

Our Funders

© COPYRIGHT 2016 UNIVERSITY OF WASHINGTON

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- The Science of Carnivore Hunting

Pre-reading questions:

1. Before you read the text on carnivore hunting, take a moment and consider what you might know already about the topic. What are some arguments for and against hunting carnivores?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. What are some arguments for legalized wildlife hunting?

4. What are some arguments against legalized hunting?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What are some sustainable ways that carnivore hunting might be regulated?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

Video

ACTIVITY PLAN

Oil Palm Plantations: Effects on Tropical Rainforests

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

- Students will compare ecosystem biodiversity in tropical rainforests and oil palm plantations.
- Students will reflect on the benefits and costs of transforming a tropical rainforest into an oil palm plantation to supply the global market.
- Students will identify aspects of a video that reveal an author's point of view.
- Students will cite specific textual evidence to support analysis of an author's purpose.
- Students will determine who might benefit and who might be harmed by each message.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.C
	LS2.C
C3 Framework Social Studies Concepts	D2.Eco.2.6-8
	D2.Geo.11.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.6
	CCSS.ELA-LITERACY.RH.6-8.7
	CCSS.ELA-LITERACY.WHST.6-8.1.A

Vocabulary:

biodiversity, Malaysia, Borneo, oil palm, rainforest tourism, monoculture, oil palm plantation

Media Type(s): TV commercial, documentary film



A Gift from Nature, A Gift for Life
TV commercial, Malaysian Oil palm Council, 2007
1:00 min.



Living Together Documentary Film, BBC, 2007
2:47 min.

Preparation and Materials:
*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use These Materials* section.

Preparation:
- Download and review the *How to Use These Materials* section associated with this kit.

Materials for the Lesson:
- Four-page Student Handout: The Value of Endangered Species
- Two-page Student Worksheet: Oil Palm Plantations and Biodiversity
- Two videos

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the two film clips. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Endangered Species – Lesson 4: Rainforest Biodiversity

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Endangered Species – Lesson 1: slides 17, 20, 21

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- How do oil palm plantations and tropical rainforests compare in terms of biodiversity?
- How have people impacted the biodiversity of oil palm plantations and tropical rainforests?

Social Studies

- What are some costs and benefits of preserving rainforests for ecotourism and sustainable harvest products vs. transforming forests into plantations for the oil palm industry?
- How might world trade patterns be impacted if a) all tropical rainforests were preserved or b) all tropical rainforests were transformed into export-based plantations?

ELA

- What messages are suggested about the impact of oil palm plantations on rainforest biodiversity?
- What evidence do you see in the film clip to support your analysis?

Media Literacy

- What techniques does the filmmaker use to convey their message?
- What is left out of this message that might be helpful to know?
- Who made this and what was their purpose?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?
- What questions do you have about this?

Writing Prompt for Synthesis Assessment in the Sub-Topic, *Oil palm Plantations*

Draw evidence from the handout and the film clips to support or oppose this statement: "The world economy benefits from wise agricultural use of forested lands."

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested about the impact of oil palm plantations on rainforest biodiversity? What evidence do you see in the film clip to support your analysis?

Possible Answer: Doc 1: Oil palm plantations enhance biodiversity.
Evidence: Oil palm plants are shown interspersed with images of plants and animals with a voice over :"This gift for nature, this gift for life, Malaysian palm oil …It gives life, vitamins, energy."
Doc 2: Oil palm plantations dramatically reduce rainforest diversity.
Evidence: A majority of those interviewed (3 out of 4) suggest that oil palm plantations dramatically reduce rainforest diversity. M.A. Sanjayan, lead scientist of the Nature Conservancy: "a monoculture reducing the rainforest to small chunks;" Huw Cordey, Planet Earth producer: "an oil palm plantation is the antithesis of a rainforest…reducing your diversity enormously;" James Lovelock, independent scientist: "the tropical rainforest (has) great diversity…that cannot be replaced by a single plantation of trees." One interviewee suggests that rainforest depletion has been overstated. Peyton Knight, National Center for Public Policy research: "I view with a great deal of skepticism reports in how fast the rainforest is decreasing."

Media Literacy

Question: What techniques does the filmmaker use to convey their message?

Possible Answers: Doc #1: The images of the young man running through the plantation and stopping to appreciate nature put the viewer in the role of appreciating what is presented as a oil palm plantation. The soft and calming music and the images of hummingbird, water drops and forest-like surroundings add to the idea that an oil palm plantation is a good place to embrace nature.
Doc 2: They choose to include 3 out of 4 speakers with a similar perspective. They intersperse the interview frames with images of tree cutting, sounds of a chainsaw and a long pan of large oil palm plantations with a background of ominous low tone orchestral sounds to visually underscore the tragedy of rainforest depletion. They include an interview in which a frowning filmmaker says that seeing the oil palm plantations "was depressing…almost brought tears to your eyes." They use an aerial view of clouds amongst rainforest trees backed with rainforest animal sounds to highlight the role of the rainforest in the water cycle.

Question: What is left out of this message that might be helpful to know?

Possible Answers: Doc 1 does not address what existed in this place before the plantation. It does not address whether people or animals displaced to create this plantation or how cutting down the original forest impacts the ecosystem. It does not note who benefits from oil palm monoculture and who is harmed. As regards sustainability claims we might ask about the meaning of "sustainably produced since 1917" and about how can one know if palm oil is in a particular product and if it is sustainably produced.
Doc 2 does not address what the people who live or work on the oil palm plantations think nor about the benefits of palm oil. It does not address what oil palm production might have to do with the likely viewer of this program in Britain or the U.S. This excerpt leaves unanswered what people are doing to stop rainforest depletion.

CIFOR | SUBSTRATE | FRANÇAIS | BAHASA | ESPAÑOL

FORESTS NEWS

NEWS

Scientific review shows oil palm plantations hurt biodiversity

Biofuels offer a promising way to respond to energy demand, but what are the consequences for native forest species?

Share Tweet 0 Shares

JULIE MOLLINS

Thursday, 20 Mar 2014



"Es indispensable contar con una variedad de especies de plantas, animales y microorganismos –todas ellas desempeñan papeles importantes en el mantenimiento del balance de la diversidad biológica del mundo y en la estabilización del medio ambiente", afirma Sini Savilaaksko, ecóloga especializada en bosques tropicales del Centro para la Investigación Forestal Internacional. Fotografía: CIFOR/Tim Cronin

BOGOR, Indonesia — New research reveals that oil-palm plantations established on primary or secondary forests are unsuitable habitats for the majority of forest-dwelling native species, a finding that indicates biodiversity may be compromised, according to a new report.

Concerns over growing energy demand and the impact of fossil fuels on climate change and global warming have led to an increased interest in developing plant-based biofuels — such as those sourced from the oil palm and other plant materials which — at least in theory — offer a promising way to respond to energy demand without increasing greenhouse gas emissions.

Biofuels are also considered beneficial to society because their production can help increase rural incomes, reduce poverty levels, restore degraded lands and promote economic development.

On the downside for forests, expanding oil palm cultivation leads to deforestation and destroys natural habitats, said Sini Savilaakso, a tropical forest ecologist working with the Center for International Forestry Research (CIFOR).

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

"Currently, palm oil is produced mainly for food, meaning that cultivation for biofuel production has as yet made little contribution to land-use change patterns, but it's important to understand the potential consequences of expanding biofuel cultivation on biodiversity and related ecosystem functions," she said.

SYSTEMATIC SEARCH

Scientists reviewed 25 research papers — curated from a whittled-down list of more than 9,000 — to see if industrial and smallholder cultivation of oil palm, soybean and the jatropha plant led to loss of biodiversity due to deforestation and fragmentation.

They searched out relevant peer-reviewed research papers in academic literature databases, Internet search engines, websites of specialist organizations and in bibliographies that included data on relevant subjects, exposure and outcomes.

Search parameters also ensured that the research was relevant — it must have been undertaken in the tropics, examined floral and faunal species and focused on areas where land had been converted from forest to plantation.

Due to a lack of available reports in a range of tropical forest countries and on soybean and jatropha, scientists ultimately focused their systematic review on oil palm plantations in Malaysia.



Source: Roundtable on Sustainable Palm Oil

During their search, they also looked for literature that measured the effectiveness of such voluntary sustainable biofuel production standards as the principles established by the Roundtable on Sustainable Palm Oil in 2004 and by the Roundtable on Sustainable Biofuels in 2007.

Scientists learned that none of the studies had tried to assess the impact of such standards on biodiversity, and only a few indicated whether the plantations were complying with them, Savilaakso said.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

BIODIVERSITY BREAKDOWN

An averaging method was used to calculate the mean change in the number of shared species between oil palm habitats and forests. All but one of the 23 studies reviewed contained information on species composition and showed a difference between forests and oil palm plantations.

In addition, only one study examined the differences of species richness and community composition between smallholder and industrial plantations. It showed that smallholdings comprised of trees planted at different times supported higher bird richness than industrial plantation estates with trees of a uniform age.

Overall, the review was limited due to a lack of landscape-level comparisons, Savilaakso said.

"Landscape-level studies could give us a better understanding of the impacts of biofuel crop cultivation on biodiversity and ecosystem function because we'd understand the broader impacts beyond simple habitat comparisons," Savilaakso said.

A "landscapes approach" takes a holistic, integrated attitude toward improved land management.

"A variety of plant, animal and microorganism species is critical — all play large roles in maintaining the balance of the world's biological diversity and stabilizing the environment," Savilaakso said.

For more information on the topics discussed in this article, please contact Sini Savilaakso at s.savilaakso@cgiar.org or Manuel Guariguata at m.guariguata@cgiar.org

CIFOR's research on biofuels and biodiversity is part of the CGIAR Program on Forests, Trees and Agroforestry and is supported by the UK Department for International Development, the government of Finland, ETH Zürich, and Agricultural Research for Development (CIRAD).

Follow CIFOR Evidence-based Forestry on Twitter by clicking here

FURTHER READING

CIFOR InfoBrief: Palm oil and biodiversity

Systematic review of effects on biodiversity from oil palm production

A review of environmental issues in the context of biofuel sustainability frameworks

Synthesis: Bioenergy, sustainability and trade-offs

Biodiversity: Oil-palm replanting raises ecology issues

Establishing the evidence base for maintaining biodiversity and ecosystem function in the oil palm landscapes of South East Asia

Transformations in EU biofuels markets under the Renewable Energy Directive and the implications for land use, trade and forests

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Oil Palm Plantations and Biodiversity

Pre-reading questions:

1. Before you read the text on oil palm plantations and biodiversity, take a moment and consider what you might know already about the topic. What are some impacts of oil palm plantations on biodiversity?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. Why are forests transformed into oil palm plantations?

4. What are some consequences of oil palm plantation cultivation?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. How did scientists study the impact of oil palm plantations on biodiversity?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

THEME 3:
Climate Change & Water

Sub-Topic: Valuing Water
Activity Plan 209
Student Materials.....213
Sub-Topic: Watersheds
Activity Plan 219
Student Materials.....223
Sub-Topic: Drought Causes
Activity Plan 229
Student Materials.....233
Sub-Topic: Drought & Farming
Activity Plan 239
Student Materials.....243
Sub-Topic: Poverty
Activity Plan 249
Student Materials.....253
Sub-Topic: Natural Gas
Activity Plan 259
Student Materials.....263
Sub-Topic: El Nino
Activity Plan 267
Student Materials.....271
Sub-Topic: Extreme Weather
Activity Plan 277
Student Materials.....281
Sub-Topic: Sea Level Rise
Activity Plan 287
Student Materials.....291

ACTIVITY PLAN

PowerPoint

Valuing Water: Different Perspectives

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

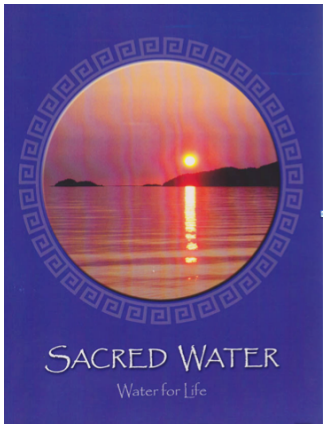
- Students will consider human impacts on freshwater resources.
- Students will reflect on the role of non-profit and corporate organizations in water stewardship.
- Students will identify aspects of book covers and tables of contents that reveal an author's purpose.
- Students will read and analyze visual and print information in diverse texts.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.A
	ESS3.C
C3 Framework Social Studies Concepts	D2.Eco.2.6-8
	D2.Eco.9.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.6
	CCSS.ELA-LITERACY.RH.6-8.7
	CCSS.ELA-LITERACY.WHST.6-8.1A

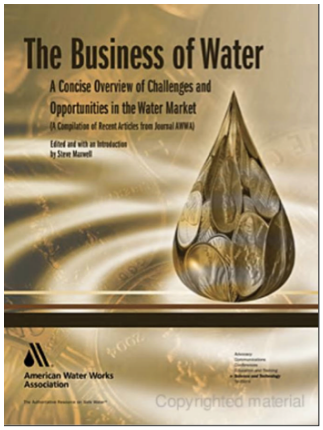
Vocabulary:

freshwater resources, environmental contamination, pesticides, food and medicine security, water market, water utility, wastewater, desalination, commodity

Media Type(s): book covers, tables of contents



Sacred Water: Water for Life, book cover & table of contents, North American Water Office, 2010



The Business of Water, book cover & table of contents, American Waterworks Association, 2008

Preparation and Materials:
*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use These Materials* section.

Preparation:
- Download and review the *How to Use These Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: The Value of Water and the Meaning of Water Law for the Native Americans Known as the Haudenosaunee*
- Two-page *Student Worksheet: A Native American View of Water*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Sustainability: Food, Water and Agriculture – Lesson 11: The Value of Water

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Resource Depletion – Lesson 1: Slides 37, 38, 40, 41, 44
Media Constructions of Resource Depletion – Lesson 5: Cochabamba Water For Sale
Media Constructions of Sustainability: Food, Water & Agriculture – Lesson 12: Who Owns the Water?
Media Constructions of Sustainability: Finger Lakes – Lesson 22: Watershed Stakeholders
Media Constructions of Sustainability: Finger Lakes – Lesson 23: Onondaga Lake

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- How have human activities affected the quality and availability of freshwater resources?
- How can people manage our water use so that it will be available for future generations?

Social Studies

- What are some benefits and costs of viewing water as a sacred creation or as a commodity?
- What role do non-profit and corporate organizations play in water stewardship.

ELA

- What messages are suggested about the values we place on water?
- What evidence do you see in the cover and table of contents to support your analysis?
- What is the suggested meaning of the title?

Media Literacy

- What is the mission of the group that produced this message and how does the mission inform the message?
- Can you judge a book by its cover? Can you judge a book by its table of contents? Which is the better indicator of the substance of the book?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?
- What questions do you have about this?

Writing Prompt for Synthesis Assessment in the Sub-Topic, *Valuing Water*

Draw evidence from the handout and the images to support or oppose this statement:
"Water's value as a commodity helps to protect freshwater resources for future generations."

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested about the values we place on water
What evidence do you see in the cover and table of contents to support your analysis?
Possible Answer: Doc 1: Water is a sacred gift from creation and people should help to protect it.
Evidence: Cover: The sacred nature of water is implied in the title and the image of the sun reflected on the water at dawn. Contents: Human agency in protecting water resources is suggested in the repeated words, "Disruption" and "What Can We Do?"
Doc 2: Water is a financial commodity and people should use investment strategies to maintain water resources.
Evidence: Cover: The nature of water as a commodity is illustrated in the drop of water with coins embedded and the title describing water as "business" and "market." Contents: Investment in water is referenced in the words, "Water is cheap," "Water technology Business" and "Water: Resource or Commodity."

Media Literacy

Question: What is the mission of the group that produced this message and how does the mission inform the message? NOTE: Possible answers based on brief online research.
Possible Answers: Doc 1 was produced by the North American Water Office (NAWO) which says its mission is "to educate people about solutions to environmental problems caused by society's wastes." The cover and contents suggest that NAWO seeks to educate people about environmental problems related to the disruption of sacred water by human activities such as pesticide production and mercury mining.
Doc 2 was produced by the American Water Works Association (AWWA), whose founding purpose is "for the exchange of information pertaining to the management of water-works, for the mutual advancement of consumers and water companies, and for the purpose of securing economy and uniformity in the operations of water-works." The cover and contents suggest that AWWA is committed to water company management in service to a secure water-based economy.

Question: Can you judge a book by its cover? Can you judge a book by its table of contents? Which is the better indicator of the substance of the book?
Possible Answers: Both a cover and the table of contents provide clues to a book's contents however a cover is primarily an advertisement meant to encourage the potential reader to purchase the book. Both forms – cover and chapter titles – represent the point of view of the author and/or publishing organization by selecting certain words and images to accentuate the messages that are contained within the body of the work being advertised and previewed. The table of contents typically contains much more information about the contents of a book than the cover does and thus is a better indicator of the substance.

Cornell Journal of Law and Public Policy

Volume 16
Issue 3 *Summer 2007*

Article 1

The Value of Water and the Meaning of Water Law for the Native Americans Known as the Haudenosaunee

Joyce Tekahnawiiaks King

From the perspective of the traditional Haudenosaunee, we speak in terms of *responsibilities* with respect to water, not in terms of water *rights*. This shift in emphasis is not casual in our eyes and takes us to the central premise of this paper. From time immemorial, we have held the view that the "law of the land" is not man-made law, but a greater natural law, the Great Law of Peace.[9] This law, in our view, is divine. The Haudenosaunee have a deep respect for the waters of the Earth. For example, one of the root words for "rain" in Mohawk means expensive, or precious or holy. Culturally, we would not abuse this resource. Our society treats and cares for the waters as a sacred element so that water remains pristine.[10]

No discussion of "Native American water law" is complete without acknowledging that multiple frames of reference come into play, legally speaking, when traditional Native people are consulted about water resources. What matters here are human relationships of *responsibility*. Responsibilities, like rights, are terms that have different implications depending on the individuals' learning and experience. In law, some will associate it with the professional responsibility code emphasized in law school training. Others will think of fiduciary responsibilities, a familiar part of trust law. But moral behavior towards other people and towards the natural world brings together personal and legal responsibility; it is left to responsible individuals acting on their own good judgment rather than on the basis of legal prerequisite to behave morally and responsibly.

We Haudenosaunee believe at one time in history, all creatures could communicate with each other. Even water could communicate—for example to the fish that lived in it. What the water might say is, "You're swimming the wrong way." Today, however, water has lost its ability to communicate. The responsibility for its voice has been passed on to the Haudenosaunee! We are the surrogates for voiceless Creation.

This paper is intended to assist readers in appreciating the Haudenosaunee position on responsibility—namely, that personal responsibili-

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ties towards water are established according to our law and are really our inherited moral and spiritual responsibilities. This appreciation will require a deeper acquaintance with indigenous culture. In particular, four components of Haudenosaunee law are significant to us as inherent laws. These components, addressed below, which predate the arrival of European explorers, voyageurs, traders, and settlers in North America, are: Haudenosaunee Cosmology and the Original Instructions, which includes the *Ohenton Kariwatehkwen* (*Oh-he(n)-doo Gully-wa-deh-qua*) or loosely translated as "the words that come before all else"; the *Kaianerekowa* (*Ga-yawn-ne-lit-goe-wa*) or the Great Law of Peace; and the *Kaswentha* (*Gus-won-ta*) or Two Row Wampum and other treaties.[11] Part II of the paper will examine the Haudenosaunee Environmental Task Force Position Paper on the Great Lakes.[12] I will use it as a lens for understanding water rights and water law from an indigenous perspective.

I. HAUDENOSAUNEE WELTANSCHAUUNG

Water is the core of the Haudenosaunee weltanshauung. In the Haudenosaunee Creation Story, Earth was a planet of water and water creatures. Land was only a memory, a legend known to the water creatures that inhabited this planet. The planet was not fit for beings belonging to the land. Earth, in its true sense, became reality after the first being, the SkyWoman and the grandmother of the Creator, fell from the sky. With assistance from the water creatures and with the SkyWoman's special abilities, land was created on a turtle's back (hence the term "Turtle Island" to indicate North America.) The lesson in the Haudenosaunee Creation Story is that water is the primary element of the planet Earth. According to Haudenosaunee teachings, water is sacred on Earth, although its contemporary treatment would suggest otherwise.

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

9 *See* Oren Lyons, *Introduction: When You Talk About Client Relationships, You Are Talking About the Future of Nations*, *in* RETHINKING INDIAN LAW, *supra* note 3, at vi ("There is one law which prevails over all law—and that's the universal law, the natural law. And it will prevail . . . . And we are all subject to it.").

10 Respect for the water: Our villages were not built near the waters so as not to "pollute" the waters. In fact, there is no word in the Mohawk language for pollution or garbage! The root word for "ugly/bad" is added to a Mohawk word to make the new word an equivalent of being polluted. Therefore, the translation for polluted water is "ugly water." We also go so far as to make sure when we draw water from the river that the container is dipped in the water *with* the current so that the water's natural flow will not be interrupted, even though dipping the container against the current will fill up the container faster.

11 I need to interrupt to make a crucial point. I will sometimes be obliged to use the common English translation of a Mohawk word, but there is a conflict the reader must be aware of. These translated words are inadequate and do not do justice to the descriptive words found in indigenous languages. The common English equivalents have not embodied the precise connotations associated with words used in the Haudenosaunee languages. Although I cannot go through all the mistranslations, I have tried to correct the translations I am using in this paper. For example, when I refer to the three principles in the Great Law of Peace—peace, power and righteousness—"peace" is not a correct translation of *skennen*; "power" is not a correct translation of *ka'satstenhse:ra*; and "righteousness" does not do justice to *ka'nikonri:io*. Upon further examination of these three principles and from a Mohawk speaker's perspective, a better translation for *skennen* is "a state of peacefulness"; a better equivalent for *ka'satstenhse:ra*, if the neologism may be permitted, is "a state of strengthfulness" (further to this equivalent, Mohawk elders have explained *ka'satstenhse:ra* as a strength in the unity of the people, not the power or might associated with guns or dictatorship); and a better translation for *ka'nikonri:io* is "a state of goodmindedness."

12 Joyce King et al., Haudenosaunee Position Paper on the Great Lakes (2005) (on file with *Cornell Journal of Law and Public Policy*).

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- A Native American View of Water

Pre-reading questions:

1. Before you read the text on the value of water for Haudenosaunee or Iroquois people, take a moment and consider what you might know already about the topic. Why do Native American people place such a high value on water??

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. Why do the Haudenosaunee consider themselves to have a *responsibility* for water protection rather than a right to water?

4. How does the root meaning of the word "rain" in the Mohawk language help to explain the value of water for Mohawk people?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What role does water play in the Haudenosaunee Creation Story?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this article? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

Watersheds: Stewardship & Climate Change

PPT
PowerPoint

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

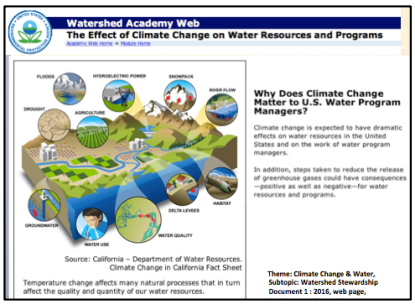
Objective Options:

- Students will consider how awareness of climate science can help reduce human vulnerability to the impacts of climate change.
- Students will reflect on which strategies might be most useful to deal with climate change impacts on human communities.
- Students will cite textual evidence to support analysis of government documents related to climate change and water stewardship.
- Students will integrate visual information presented in maps and graphic displays with other information in print and digital texts.

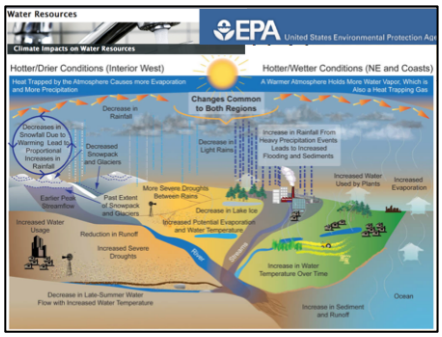
Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS2.C
	ESS3.D
C3 Framework Social Studies Dimension 2 Concepts	D2.Geo.9.6-8
	D4.7.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.1
	CCSS.ELA-LITERACY.RH.6-8.4
	CCSS.ELA-LITERACY.RH.6-8.7

Vocabulary:
climate change, evaporation, precipitation, snowpack, runoff, drought, water program manager

Media Type(s): web page



The Effect of Climate Change on Water Resources and Programs
web page: Environmental Protection Agency, 2016



Climate Impacts on Water Resources
web page: Environmental Protection Agency, 2016

Preparation and Materials:

*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use Materials* section.

Preparation:
- Download and review the *How to Use Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: Climate Change and Watersheds: Exploring the Links*
- Two-page *Student Worksheet: Studying Climate Change & Watersheds*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:

Media Constructions of Sustainability: Finger Lakes – Lesson 22: Watershed Stakeholders

Connections to Project Look Sharp Lesson Resources:

Media Constructions of Resource Depletion – Lesson 1: Slides 37, 38, 40, 41, 44

Media Constructions of Sustainability: Food, Water & Agriculture – Lesson 12: Who Owns the Water?

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- How can awareness of climate science help reduce human vulnerability to the impacts of climate change?
- What are some ways in which climate change can change the ways in which water moves through watersheds?

Social Studies

- Which strategies might be most useful to deal with climate change impacts on human communities?
- How does climate change create conflict and suggest the need for cooperation between nations and communities over issues of water access?

ELA

- What messages are suggested related to climate change and water stewardship?
- What evidence do you see in the document to support your analysis of the message?
- What do these terms mean? "water program manager" and "heavy precipitation event"?

Media Literacy

- What visual elements did the designers choose to reinforce the message?
- Which of these pages might be more useful for water managers as they make adaptation plans for water stewardship during climate change? Why do you think that?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?
- What questions do you have about this?

Writing Prompt for assessment in the sub-topic, *Watersheds*

Draw evidence from the handout and the PPT documents to write about this topic, "What human and environmental needs should water managers in my region consider as they plan for water stewardship in times of global climate change?"

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested related to climate change and water stewardship? What evidence do you see in the document to support your analysis of the message?
Possible Answer: Doc 1: U.S. water program managers must become aware of the many ways in which climate change impacts the water resources for which they are stewards.
Evidence: Title: *Why Does Climate Change Matter to U.S. Water Program Managers?;* Text: *Climate change is expected to have dramatic effects on water resources in the United States and on the work of water program managers.;* Image: The circles highlight various sites, human uses, and concerns related to freshwater resources in times of climate change.
Possible Answer: Doc 2: Water managers must prepare for different stewardship challenges depending on where they live in the U.S..
Evidence: Text: *Hotter/Drier Conditions (Interior West); Hotter/Wetter Conditions (NE and Coasts)*
Image: Different water impacts are reflected in the color choices for each side with yellow and brown marking drier conditions on the left (interior west) side and green on the right (NE and coasts) side.

Question: What do these terms mean?
Water program manager – individuals and agencies responsible for managing water resources at local, regional and national levels
Heavy precipitation event – An unusually large amount of precipitation compared with past normal ranges often associated with a deluge of rain or blizzard of snow.

Media Literacy

Question: What visual elements did the designers choose to reinforce the message?
Possible Answers: Doc 1 Designers use magnifying glass circles to highlight various sites, human uses, and concerns related to freshwater resources in times of climate change.
Doc 2 Designers use arrows of different sizes and directions to indicate evaporation and precipitation pathways. They also make different color choices for each side with yellow and brown marking drier conditions on the left (interior west) side and green on the right (NE and coasts) side.

Question: Which of these pages might be more useful for water managers as they make adaptation plans for water stewardship during climate change? Why do you think that?
Possible Answers: Doc 2 is probably a better tool for water managers since it gives detailed information about the variable nature of climate change impacts in different regions compared with **Doc 1** which simply indicates general categories of concern.

EPA United States Environmental Protection Agency

Español | 中文: 繁體版 | 中文: 简体版 | Tiếng Việt | 한국어

Learn the Issues | Science & Technology | Laws & Regulations | About EPA

Search EPA.gov

Related Topics: Science Matters

Contact Us Share

EPA Science Matters Newsletter: Climate Change and Watersheds: Exploring the Links (Published August 2013)

EPA researchers are using climate models and watershed simulations to better understand how climate change will affect streams and rivers.

A warming climate threatens hotter summers and more extreme storms. We know we may need to upgrade our air conditioning systems and make emergency preparedness kits, but aside from temperatures and storms, what are other ways we will be affected by climate change?



- Climate Change

EPA water scientists and their partners are studying how climate change may affect watersheds—the network of rivers and streams that feed into larger water bodies such as big rivers, lakes, and oceans. A recent EPA report, referred to as the 20 Watersheds Report, combines climate change models and watershed simulations to develop a better understanding of what changes to streams and rivers we might expect over the next several decades.

- Watersheds
- Watershed Modeling to Assess the Sensitivity of Streamflow, Nutrient, and Sediment Loads to Potential Climate Change and Urban Development in 20 U.S. Watersheds (External Review Draft)

"A key thing that's unique about this work is the scope; we applied a consistent set of methods and models to 20 large watersheds throughout the nation," says lead scientist Tom Johnson.

Johnson's team of researchers used different climate change scenarios to model changes in streamflow volume and water quality in the 20 chosen watersheds.

"Climate can be defined loosely as average weather," Johnson explains. "Climate change scenarios describe potential future changes in climate, like temperature or precipitation."

For a given climate change scenario, watershed simulations were used to determine changes in streamflow (the actual volume of water running through the streams) and in nutrient and sediment pollution levels.

- Nutrient Pollution

In addition to climate change scenarios, researchers also took into account urban and residential land development scenarios in their watershed simulations. The ways people use and alter the land (such as building roadways, parking lots, etc) will also have an impact on water resources. The land development scenarios used were based on projected changes in population and housing density in the study watersheds.

Research results show a great variety in watershed responses to climate and urban development scenarios in different parts of the country. Generally, simulations suggest certain trends for streamflow: that flow amount decreases in the Rockies and interior southwest, but increases in the northeast. Results also show higher peaks in streamflow that can increase stream bank erosion and sediment transport, as well as potentially increase nutrient pollutants. Overall, the research shows that the potential changes in streamflow and water quality response in many areas could be very large.

"This information can be used by water managers to better understand if and how things like water quality and aquatic ecosystems might be vulnerable, and to help guide the development of response strategies for managing any potential risk," says Johnson.

For example, where water is suggested to be scarce, managers can plan alternative water supply methods; where water is expected to become highly polluted from nutrients and sediment, managers can take action now to limit the actual impact of these pollutants on the water resource.

The findings of EPA's 20 Watersheds Report will help water and resource managers recognize the changing conditions of streams and rivers and identify any future conditions that may need addressing.

˅ Using Three Watersheds to Compare Methods

Prior to undertaking the 20 Watersheds research project, EPA scientists completed a more modest study of three watersheds comparing different techniques to assess watersheds under changing climate conditions.



Researchers applied climate change scenarios to three very different types of watersheds: streams in southern Maryland, Arizona's San Pedro River, and California's Sacramento River. They then examined three different factors that could reflect watershed health under changing climate scenarios: fish populations, stream-side vegetation and wildlife, and water availability, respectively for each watershed.

By comparing watershed assessment techniques and results, researchers were able to identify assessment methods that worked well and areas where methods could be improved.

For example, researchers previously found it difficult to actually link the different models they were using (such as climate models to watershed models to fish models) to project changes in fish populations under climate change. As a result of this research, they will now be able to do so, incorporating the effects of climate change into new or existing models that advance the understanding of the impacts on watersheds and aquatic ecosystems.

This and other findings from this study helped pave the way for the larger-scale 20 Watersheds project.

- Climate and Land Use Change Effects on Ecological Resources in Three Watersheds: A Synthesis Report (Final Report)

› Developing Climate-Ready Methods for Assessing Rivers and Streams

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

Climate Change Research

EPA research improves knowledge of the health and environment effects of climate change and provides sustainable solutions for communities to effectively manage and reduce the impacts of a changing climate.

Research Areas for Climate Change Impacts, Adaptation and Mitigation



- Air quality and climate change
- Ecosystems and climate change
- Energy and climate change
- Human health and climate change
- Water and climate change
- Wildfire Research

Publications



- Science Inventory products about climate change research
- Science Matters: Climate change newsletter

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Studying Climate Change & Watersheds

Pre-Reading questions:

1. Before you read the text on research studying the impact of climate change on watersheds, take a moment and consider what you might know already about the topic. How might climate change affect watersheds?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. What is a watershed? Why does a government agency, the Environmental Protection Agency, want to study climate change impacts on watersheds?

4. How has the EPA gone about studying the impact of climate change on watersheds?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What are some things that the EPA studies have determined about the ways in which climate change affects local and regional watersheds?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

Drought Causes: Climate Change Impacts

PowerPoint

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

- Students will consider the relationship between climate change and droughts.
- Students will reflect on the causes and adaptive solutions to periods of drought.
- Students will cite evidence to support analysis of text and images related to drought and climate change.
- Students will write about opposing claims related to climate change and the causes of drought.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS2.C
	ESS3.D
C3 Framework Social Studies Dimension 2 Concepts	D2.Geo.2.6-8
	D4.6.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RST.6-8.1
	CCSS.ELA-LITERACY.RST.6-8.7
	CCSS.ELA-LITERACY.WHST.6-8.1A

Vocabulary:

drought, climate change, water security, food security, atmospheric & ocean patterns

Media Type(s): web pages



Climate Change Threatens Health
Web page: Natural Resources Defense Council, 2015



California Drought Due to Natural Causes
Web page: Tech Times, 2015

Preparation and Materials:

*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use Materials* section.

Preparation:
- Download and review the *How to Use Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: Causes of Drought: What's the Climate Connection?*
- Two-page *Student Worksheet: Drought & Climate Change*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Connections to Project Look Sharp Lesson Resources:

Media Constructions of Sustainability: Upper Elementary – Unit 3: Water, Lesson 3
Media Constructions of Resource Depletion – Lesson 1: Slides 37, 38, 40, 41, 44
Media Constructions of Resource Depletion – Lesson 5: Cochabamba Water For Sale
Media Constructions of Sustainability: Food, Water & Agriculture – Lesson 12: Who Owns the Water?
Media Constructions of Sustainability: Finger Lakes – Lesson 21: Climate Change, Agriculture & Sustainability
Media Constructions of Sustainability: Finger Lakes – Lesson 22: Watershed Stakeholders
Media Constructions of Global Warming – Lesson 5: Agriculture

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- What are some theories about the causes of recent extreme drought conditions in the western United States?
- How can climate science research help to shape human responses to climate change?

Social Studies

- How do geographers use maps and photos to explain relationships between drought and the present and future needs of human populations?
- What are some of the challenges and opportunities faced by people who want to help communities adapt to the realities of extreme drought?

ELA

- What messages are suggested related to drought and climate change?
- What evidence do you see in the document to support your analysis of the message?
- How does the information contained in the visual image help to enhance the meaning of the written text?

Media Literacy

- What is the mission of the group that produced this message and how does the mission inform the message?
- What information is left out that might be important to know?
- What are the sources of the information and are they credible?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?
- What questions do you have about this?

Writing Prompt for assessment in the sub-topic, *Drought & Farming*

Draw evidence from the handout and the web pages to support to or to oppose this statement: "Climate change will force many communities in the United States to find ways to adapt to extreme drought conditions in the future."

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested related to drought and climate change?
What evidence do you see in the document to support your analysis of the message?
Possible Answer: Doc 1: Climate change will cause extreme drought conditions forcing many people to confront shortages of water and food.
Evidence: Title: *Climate Change Threatens Health & Drought: Threats to Water and Food Security;* Text: *Climate change will significantly affect the sustainability of water supplies in the coming decades*
Possible Answer: Doc 2: The drought in California is the result of natural factors and is not caused by global climate change.
Evidence: Title: *California Drought Due to Natural Causes, not Global Warming*; Text: *the drought, claims the report, is primarily caused by natural atmospheric and oceanic patterns*

Question: How does the information contained in the visual image help to enhance the meaning of the written text?
Possible Answer: Doc 1: The images of dead fish, parched land and dried crops and the bright red drought vulnerable areas on the map highlight the impacts of drought on human and natural populations.
Possible Answer: Doc 2: The image of the near dry reservoir behind the dam illustrates the severity of the drought.

Media Literacy

Question: What is the mission of the group that produced this message and how does the mission inform the message? NOTE: Possible answers based on brief online research.
Possible Answers: Doc 1 The Natural Resources Defense Council (NRDC) says it is "tackling the climate crisis at its source: pollution from fossil fuels…And we fight oil and gas projects that would pump out even more pollution." This orientation suggests that the producer wants to highlight the impacts of climate change so as to underscore its commitment to educate the public about the dangers of climate change.
Doc 2 *Tech Times* says that it covers "news on technological innovation and how business and technology intersects, influences and impacts different markets and industries." Its decision to publish a story highlighting the potential "advancements in the development of early warning systems for droughts, which could assist industries and water managers in preparing for future droughts" might appeal to its target audience of technological innovators.

Question: What information is left out that might be important to know?
Possible Answers: Doc 1 does not address the NOAA study referenced in document 2 that attributes California's drought to natural causes. It does not mention the sources of information for NRDC's *Climate Change, Water and Risk* study or for the map showing the geographic representation of drought vulnerabilities.
Doc 2 could note studies that connect the California drought to climate change. The article should be dated by year so we might know when the NOAA study came out relative to these other studies. The article should note that the NOAA report suggests that "Determining human-induced climate change from the observational record is difficult" and "the causes of (a reported) wave response to human-induced climate change is not as yet known."

Union of Concerned Scientists
Science for a healthy planet and safer world

SEARCH

Our Work About Take Action Subscribe Donate

GLOBAL WARMING >GLOBAL WARMING IMPACTS

[SHARE]

Causes of Drought: What's the Climate Connection?

Climate change affects a variety of factors associated with drought

Drought ranks second in terms of national weather-related economic impacts, with annual losses nearing $9 billion per year in the U.S. [1] Beyond direct economic impacts, drought can threaten drinking water supplies and ecosystems, and can even contribute to increased food prices.



Within the last decade, drought conditions have hit the Southeastern U.S., the Midwest, and the Western U.S. In 2011, Texas had the driest year since 1895. In 2013, California had the driest year on record.

There are different types of drought

Drought can call to mind images of dry, cracked earth; low reservoir levels; and barren fields, yet these are actually examples of different types of drought, each of which is measured differently.

We most often think about drought in relation to precipitation, assessing the degree of dryness (in comparison to a local or regional average) and the duration of the dry period. This is known as a *meteorological drought*, which is highly specific to a region as average precipitation may vary considerably spatially.

[RELATED CONTENT]
Are Severe Rain storms, Snow storms, Drought, and Tornadoes Linked to Global Warming?
Climate Change and Your Health
Global Warming and Wildfires
A Changing Climate Worsens Allergy Symptoms

[FROM OUR BLOGS]
Reactor Core Damage: Meltdown
IVE LOCHBAUM | APRIL 5, 2016

[RELATED CONTENT]
Are Severe Rain storms, Snow storms, Drought, and Tornadoes Linked to Global Warming?
Climate Change and Your Health
Global Warming and Wildfires
A Changing Climate Worsens Allergy Symptoms

We can also think about *hydrological drought*, or how decreased precipitation affects streamflow, soil moisture, reservoir and lake levels, and groundwater recharge.



Farmers are most concerned with *agricultural drought* when available water supplies are not able to meet crop water demands. Agricultural droughts can occur for a variety of reasons, including low precipitation, the timing of water availability, or decreased access to water supplies. For instance, earlier snowmelt may not change the total quantity of water available but can lead to earlier runoff that is out of phase with peak water demand in the summer. Thus, it is possible to suffer an agricultural drought in the absence of a meteorological drought.

The United States Drought Monitor has been producing weekly maps of drought conditions throughout the country since 1999.

Climate change affects a variety of factors associated with drought

When considering the relationship of drought to climate change, it is important to make the distinction between weather and climate. Weather is a description of atmospheric conditions over a short period of time, while climate is how the atmosphere behaves over relatively long periods of time.

Individual drought periods can be understood as discrete weather events. Climate changes occur over longer periods and can be observed as changes in the patterns of weather events. For instance, as temperatures have warmed over the past century, the prevalence and duration of drought has increased in the American West [2].



Global climate change affects a variety of factors associated with drought. There is high confidence that increased temperatures will lead to more precipitation falling as rain rather than snow, earlier snow melt, and increased evaporation and transpiration. Thus the risk of hydrological and agricultural drought increases as temperatures rise.

Much of the Mountain West has experienced declines in spring snowpack, especially since mid-century [3]. These declines are related to a reduction in precipitation falling as snow (with more falling as rain), and a shift in timing of snowmelt. Earlier snowmelt, associated with warmer temperatures, can lead to water supply being increasingly out of phase with water demands.

[FROM OUR BLOGS]

Still in the Dark on TTIP: Trade Agreement with the European Union Is a Black Box
CELIA WEXLER | APRIL 8, 2016

The Trouble with Science Funding
GRETCHEN GOLDMAN | APRIL 8, 2016

Healthiest Nation by 2030? Not Without Healthier Women and Children Today
GENNA REED | APRIL 8, 2016

[ON TWITTER]

Concerned Scientists Retweeted
rose
@Rosie_Ooo
Woah! So many good questions about whose culture gets preserved and environmental justice #HistoryAboveWater
51m

Concerned Scientists Retweeted
Adam Markham
@AdamCMarkham
Cultural heritage is important to @FernandinaBeach's tourism economy and development - Adrienne Burke at #HistoryAboveWater #ClimateAction
1h

CLIMATE CHANGE



Rising temperatures are increasing wildfire risk throughout the Western U.S.

[TAKE ACTION]

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

While there is some variability in the models for western North America as a whole, climate models unanimously project increased drought in the American Southwest. The Southwest is considered one of the more sensitive regions in the world for increased risk of drought caused by climate change [4].

We must prepare for an increased risk of more frequent and severe drought conditions

Current responses to drought tend to focus on short-term measures, such as temporary water conservation and efficiency improvements, water transfers, and increased use of groundwater. However, with increased drought risk, we must incorporate longer-term efforts that increase resilience to more frequent or severe drought conditions.

We should:

- Better monitor and measure water supply and uses nationwide
- Reduce indoor water use through more efficient appliances, technologies, and behaviors
- Reduce outdoor water efficiency through drought-tolerant landscape design and improved irrigation technologies
- Increase recycling and reuse of water, including capturing and reusing stormwater, greywater, and wastewater
- Make more strategic use of groundwater

References

[1] http://www.ncdc.noaa.gov/news/drought-monitoring-economic-environmental-and-social-impacts
[2] Konstantinos and Leetenmaier. "Trends in 20th century drought over the continental United States." Geophysical Research Letters, 33.10. (2006).
[3] Mote, Philip W. "Climate-Driven Variability and Trends in Mountain Snowpack in Western North America." Journal of Climate, 19.23 (2006): 6209–6220.
[4] Sheffield, Justin, and Eric F. Wood. "Projected changes in drought occurrence under future global warming from multi-model, multi-scenario, IPCC AR4 simulations." Climate Dynamics 31.1 (2008): 79–105.
U.S. Global Change Research Program. Global Climate Change Impacts in the United States, Thomas R. Karl, Jerry M. Melillo, and Thomas C. Peterson (eds.). Cambridge University Press (2009).



New evidence suggests that ExxonMobil knew about the potential risks posed by climate change decades ago, and still chose to fund a campaign of climate deception.

Call for a federal investigation of ExxonMobil's climate deception. >

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Drought & Climate Change

Pre-reading questions:

1. Before you read the text on climate change and drought, take a moment and consider what you might know already about the topic. How are climate change and droughts related?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. What are the differences between meteorological drought, hydrological drought and agricultural drought?

4. How does global climate change affect the factors that are associated with drought?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What are some of the short-term and long-term measures that can be taken to respond to drought conditions?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

Drought & Farming: Thirsty Crops

PowerPoint

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

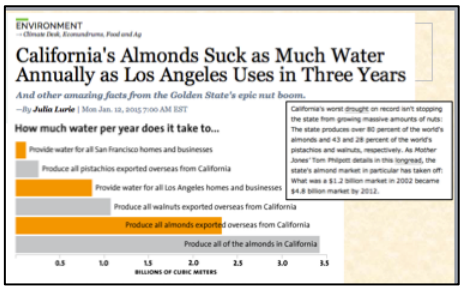
- Students will consider how agricultural demands for irrigation impact freshwater resources during times of drought.
- Students will reflect on the impact of economic decisions on the availability of fresh water.
- Students will cite textual evidence to support analysis of text and graphs on agricultural water use.
- Students will identify and distinguish techniques in graph construction to convey different messages about the decisions to grow different crops during seasons of drought.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.A
	ESS3.C
C3 Framework Social Studies Dimension 2 Concepts	D2.Eco.1.6-8
	D2.Geo.4.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RST.6-8.1
	CCSS.ELA-LITERACY.RST.6-8.4
	CCSS.ELA-LITERACY.RST.6-8.7

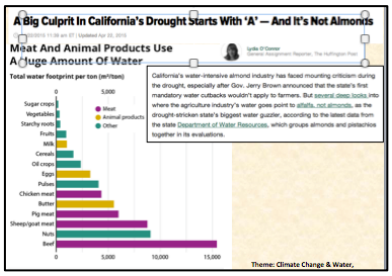
Vocabulary:

export, almond market, drought, water footprint, agriculture industry

Media Type(s): web page graphs



How Much Water Per Year
Web page graph: Mother Jones, 2015



Meat and Animal Products Use
Web page graph: Huffington Post, 2015

Preparation and Materials:

*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use Materials* section.

Preparation:
- Download and review the *How to Use Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: Water and Climate Change*
- Two-page *Student Worksheet: Drought & Agriculture*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:

Media Constructions of Sustainability: Upper Elementary – Unit 3: Water, Lesson 3

Connections to Project Look Sharp Lesson Resources:

Media Constructions of Resource Depletion – Lesson 1: Slides 37, 38, 40, 41, 44
Media Constructions of Resource Depletion – Lesson 5: Cochabamba Water For Sale
Media Constructions of Sustainability: Food, Water & Agriculture – Lesson 12: Who Owns the Water?
Media Constructions of Sustainability: Finger Lakes – Lesson 21: Climate Change, Agriculture & Sustainability
Media Constructions of Sustainability: Finger Lakes – Lesson 22: Watershed Stakeholders
Media Constructions of Global Warming – Lesson 5: Agriculture

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- Which crops require the most water for agricultural production in California?
- How do agricultural demands for crop irrigation impact limited freshwater resources during times of drought?

Social Studies

- How does the cultural pattern of meat-eating influence agricultural industry choices about crop production?
- How do the economic decisions regarding crop choices impact society and the environment during times of drought?

ELA

- What messages are suggested related to crop choices and water demands?
- What evidence do you see in the document to support your analysis of the message?
- What do these terms mean? "Golden State nut boom" and "water footprint"?

Media Literacy

- What choices did the graph designers make to have nut production appear prominent in one graph and less so in the other?
- What choices could the doc #1 graph designer have made to change the message about the almond industry?
- What information is left out of these graphs that might be important to know?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?
- What questions do you have about this?

Writing Prompt for assessment in the sub-topic, *Drought & Farming*

Draw evidence from the handout and the graphs to support to or to oppose this statement:
"Agricultural production to satisfy the large markets for nut exports and beef consumption help the U.S. economy stay strong in a time of climate change challenge."

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested related to crop choices and water demands? What evidence do you see in the document to support your analysis of the message?
Possible Answer: Doc 1: The choice to grow almonds for export puts stress on California's limited water supplies in time of drought.
Evidence: Title: *California's Almonds Suck as Much Water Annually as Los Angeles Uses in Three Years;* Text: *California's worst drought on record isn't stopping the state from growing massive amounts of nuts;* Graph: Water use for almond growing far exceeds all other categories chosen for the graph.
Possible Answer: Doc 2: The choice to grow alfalfa for beef production during California's drought is a bigger drain on water resources than almonds.
Evidence: Title: *A Big Culprit In California's Drought Starts With "A" – And It's Not Almonds*; Text: *"alfalfa, not almonds (is) the drought-stricken state's biggest water guzzler;* Graph: Water use for beef production far exceeds all other categories chosen for the graph.

Question: What do these terms mean?
Golden State nut boom – the rapid increase of nut production in California
Water footprint – the amount of fresh water used in the production of goods, in this case agricultural products, measured in cubic meters of water per ton of production

Media Literacy

Question: What choices did the graph designers make to have nut production appear prominent in one graph and less so in the other?
Possible Answers: Doc 1 designer chose to compare "nuts to nuts" rather than nuts to crops requiring a higher water demand. **Doc 2** designer chose to compare nuts to beef production crops like alfalfa which have a larger water requirement according to this graph.

Question: What choices could the doc #1 graph designer have made to change the message about the almond industry?
Possible Answers: Doc 1 designer could have chosen to compare the amount of water required for California's almond production with the amount of water required for walnut production in Yunnan, China. This would make California's water use for almond irrigation appear comparable to another major economic power in the export nut market. Alternatively the designer could compare the amount of water required to grow almonds for export in California with the total amount of water available for human consumption in a water-stressed area of North Africa or the Middle East. This would make California's expenditure of water for almond growing seem even more outlandish compared to regions where the availability of drinking water is a crisis concern.

Question: What information is left out of these graphs that might be important to know?
Possible Answers: Graph #2 is not dated so we can't know if the data has changed since its construction. We do not have the *Mother Jones* and *Huffington Post* web pages in which these graphs were placed that could give other helpful context as to why these graphs were chosen to accompany these pagers. It would also be helpful to see the original sources in which these graphs were published to see if there was more information about the topic in the original source.

Home About Us Programs **Topics** Publications Resources Wiki Search

CLIMATE INSTITUTE



TOPICS / CORE ISSUES

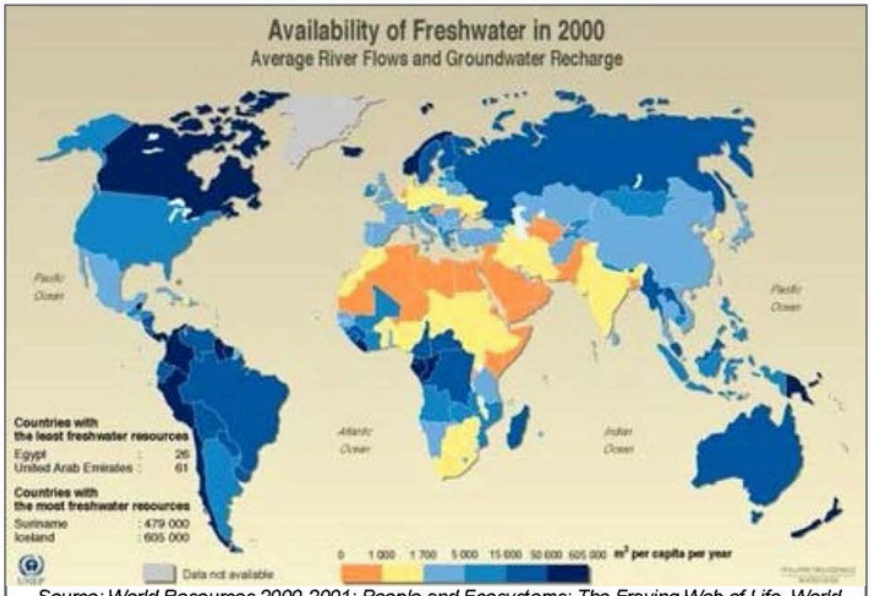
- Climate Change
- Sea Level Rise
- Extreme Weather
- Ecosystems & Wildlife
- Air Quality
- Ozone Depletion
- Human Health
- Agriculture
- Water
- Environment and Security
- Energy
- Domestic Action
- International Action
- How You Can Help

WATER

Español
中文
Italiano

The vast majority of the Earth's water resources are salt water, with only 2.5% being fresh water. Approximately 70% of the fresh water available on the planet is frozen in the icecaps of Antarctica and Greenland leaving the remaining 30% (equal to only 0.7% of total water resources worldwide) available for consumption. From this remaining 0.7%, roughly 87% is allocated to agricultural purposes (IPCC 2007).

These statistics are particularly illustrative of the drastic problem of water scarcity facing the world. Water scarcity is defined as per capita supplies less than 1700 m3/year (IPCC 2007).



Source: World Resources 2000-2001: People and Ecosystems: The Fraying Web of Life. World Resources Institute, Washington DC (2000).
Figure 1: Freshwater availability: groundwater and river flow (2000). In UNEP/GRID-Arendal Maps and Graphics Library. Retrieved 15:50, March 26, 2008.

According to the Comprehensive Assessment of Water Management in Agriculture, one in three people are already facing water shortages (2007). Around 1.2 billion people, or almost one-fifth of the world's population, live in areas of physical scarcity, while another 1.6 billion people, or almost one quarter of the world's population, live in a developing country that lacks the necessary infrastructure to take water from rivers and aquifers (known as an economic water shortage).

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

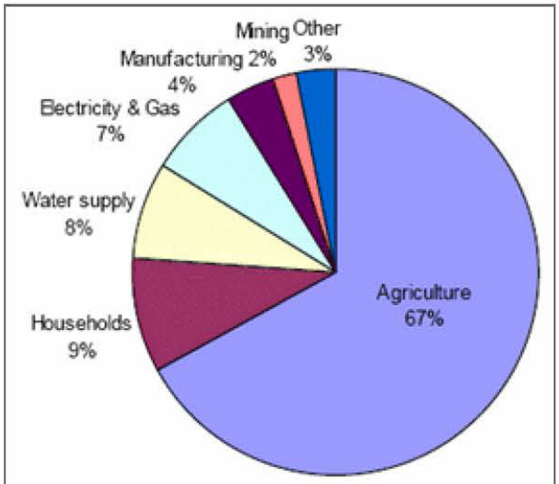


Figure 2: Water use in the world (2005)

There are four main factors aggravating water scarcity according to the IPCC:

- Population growth: in the last century, world population has tripled. It is expected to rise from the present 6.5 billion to 8.9 billion by 2050. Water use has been growing at more than twice the rate of population increase in the last century, and, although there is no global water scarcity as such, an increasing number of regions are chronically short of water.
- Increased urbanization will focus on the demand for water among a more concentrated population. Asian cities alone are expected to grow by 1 billion people in the next 20 years.
- High level of consumption: as the world becomes more developed, the amount of domestic water used by each person is expected to rise significantly.
- Climate change will shrink the resources of freshwater.

Water and Climate Change

Water scarcity is expected to become an ever-increasing problem in the future, for various reasons. First, the distribution of precipitation in space and time is very uneven, leading to tremendous temporal variability in water resources worldwide (Oki et al, 2006). For example, the Atacama Desert in Chile, the driest place on earth, receives imperceptible annual quantities of rainfall each year. On the other hand, Mawsynram, Assam, India receives over 450 inches annually. If all the freshwater on the planet were divided equally among the global population, there would be 5,000 to 6,000 m3 of water available for everyone, every year (Vorosmarty 2000).

Second, the rate of evaporation varies a great deal, depending on temperature and relative humidity, which impacts the amount of water available to replenish groundwater supplies. The combination of shorter duration but more intense rainfall (meaning more runoff and less infiltration) combined with increased evapotranspiration (the sum of evaporation and plant transpiration from the earth's land surface to atmosphere) and increased irrigation is expected to lead to groundwater depletion (Konikow and Kendy 2005).

Changes in Precipitation and Drought Patterns

Projections of changes in total annual precipitation indicate that increases are likely in the tropics and at high latitudes, while decreases are likely in the sub-tropics, especially along its poleward edge. Thus, latitudinal variation is likely to affect the distribution of water resources. In general, there has been a decrease in precipitation between 10°S and 30°N since the 1980s (IPCC 2007). With the population of these sub-tropical regions increasing, water resources are likely to become more stressed in these areas, especially as climate change intensifies.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

While some areas will likely experience a decrease in precipitation, others (such as the tropics and high latitudes) are expected to see increasing amounts of precipitation. More precipitation will increase a region's susceptibility to a variety of factors, including:

- Flooding
- Rate of soil erosion
- Mass movement of land
- Soil moisture availability

These factors are likely to affect key economic components of the GDP such as agricultural productivity, land values, and an area's habitability (IPCC 2007). In addition, warming accelerates the rate of surface drying, leaving less water moving in near-surface layers of soil. Less soil moisture leads to reduced downward movement of water and so less replenishment of groundwater supplies (Nearing et al 2005). In locations where both precipitation and soil moisture decrease, land surface drying is magnified, and areas are left increasingly susceptible to reduced water supplies.

Although projecting how changed precipitation patterns will affect runoff is not yet a precise science, historical discharge records indicate it is likely that for each 1°C rise in temperature, global runoff will increase by 4%. Applying this projection to changes in evapotranspiration and precipitation leads to the conclusion that global runoff is likely to increase 7.8% globally by the end of the century (Oki and Kanae 2006). Thus, a region that experiences higher annual precipitation and more runoff increases the likelihood for flooding.

Furthermore, in areas that are already vulnerable due to their limited groundwater storage availability, this cycle intensifies with increased warming and diminishing water supplies. In water stressed regions, variability of precipitation patterns is likely to further reduce groundwater recharge ability. Water availability is likely to be further exacerbated by poor management, elevated water tables, overuse from increasing populations, and an increase in water demand primarily from increased agricultural production (IPCC 2007).

A recent global analysis of variations in the Palmer Drought Severity Index (PDSI) indicated that the area of land characterized as very dry has more than doubled since the 1970s, while the area of land characterized as very wet has slightly declined during the same time period. In certain susceptible regions, increased temperatures have already resulted in diminished water availability. Precipitations in both western Africa and southern Asia have decreased by 7.5% between 1900 and 2005 (Dai et al 2004).

Most of the major deserts in the world including the Namib, Kalahari, Australian, Thar, Arabian, Patagonian and North Saharan are likely to experience decreased amounts of precipitation and runoff with increased warming. In addition, both semiarid and arid areas are expected to experience a decrease and seasonal shift in flow patterns. If increased temperatures cause an intensification of the water cycle there will be more extreme variations in weather events, as droughts will become prolonged and floods will increase in force (Huntington 2005).

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

References

Confalonieri, U., Menne B., Akhtar, R., Ebi, K.L., Hauengue, M., Kovats, R.S., Revich, B. and Woodward, A. 2007. Human health. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK, 391-431.

Dai, A., Trenberth, K., and Qian, T. 2004. A Global Dataset of Palmer Drought Severity Index for 1870-2002: Relationship with Soil Moisture and Effects of Surface Warming. *Journal of Hydrometeorology*. (5). 1117- 1130.

Goudie, Andrew. 2006. Global Warming and Fluvial Geomorphology. *Geomorphology*. (79). 3-4. 384-394.

Huntington, T. G. (2005). Evidence for Intensification of the Global Water Cycle: Review and Synthesis. Journal of Hydrology. (319): 83-95.

Konikow, Leonard and Eloise Kendy. (2005). Groundwater Depletion: A Global Problem. Hydrogeology (13). 317-320.

Nearing, M.A., Jetten, V., Baffaut, C., Cerdan, O., Couturier, A., Hernandez, M., Le Bissonnals, Y., Nichols, M.H., Nunes, J.P., Renschler, C.S., Souchere, V. and Van Oost, K. (2005). Modeling Response of Soil Erosion and Runoff to Changes in Precipitation and Cover. *Catena* (61). 131–154.

Oki, Taikan and Shinjiro Kanae. (2006). Global Hydrological Cycles and World Water Resources. Science (313): 5790. 1068-1072.

Vorosmarty, Charles, Green, P. Salisbury, J. Lammers, R. (2000). Global Water Resource: Vulnerability from Climate Change and Population Growth. Science (289): 5477. 284-288.

Comprehensive Assessment of Water Management in Agriculture. 2007. David Molden, ed. International Water Management Institute. 3 March 2010. PDF

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Drought & Agriculture

Pre-reading questions:

1. Before you read the text on water, climate change and drought, take a moment and consider what you might know already about the topic. How will climate change affect farming?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. What are the main purposes for which people use freshwater across the world and how much of the world's population faces water shortage problems?

4. What are the four main conditions that make water scarcity worse?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What are some of the impacts when major agricultural areas experience drought?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

Poverty: Climate Change & Water Security

PowerPoint

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

- Students will consider the conditions that make people living in poverty extremely vulnerable to the impacts of climate change.
- Students will reflect on the ways in which economic decisions affect water security for people living in poor communities and countries.
- Students will cite evidence to support analysis of text and images related to poverty, water and climate change.
- Students will conduct a short research project to explore the connections between poverty, climate change and water security.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.C
	ESS3.D
C3 Framework Social Studies Dimension 2 Concepts	D2.Geo.4.6-8
	D4.6.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.1
	CCSS.ELA-LITERACY.RH.6-8.7
	CCSS.ELA-LITERACY.WHST.6-8.7

Vocabulary:

freshwater, climate change, extreme weather, groundwater, water stress, poverty reduction targets, greenhouse gas, desertification, food insecurity

Media Type(s): web pages



Water and climate change
Web page: United Nations, 2014



Climate Change & Poverty
Web page: World Wildlife Fund, 2016

Preparation and Materials:

*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use Materials* section.

Preparation:
- Download and review the *How to Use Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: Poverty & Climate Change*
- *Two*-page *Student Worksheet: Poverty, Water & Climate Change*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Connections to Project Look Sharp Lesson Resources:

Media Constructions of Resource Depletion – Lesson 5: Cochabamba Water For Sale
Media Constructions of Sustainability: Finger Lakes – Lesson 25: Sustainable Food Security Systems
Media Constructions of Sustainability: Food, Water & Agriculture – Lesson 9: Food Security
Media Constructions of Global Warming – Lesson 5: Agriculture

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- What are some of the human activities that have impacted freshwater resources in a way that creates extreme hardship for people living in poverty?
- What can we do to reduce the vulnerability of poor people to the effects of water insecurity during a period of global climate change?

Social Studies

- How do economic decisions affect water security for people living in poor countries?
- What are the challenges and opportunities faced by those who want to help poor countries adapt to the impacts of climate change?

ELA

- What messages are suggested related to poverty, water and climate change?
- What evidence do you see in the document to support your analysis of the message?
- What do these terms mean: "water stress" and "food insecurity"?

Media Literacy

- What techniques are used to underscore the importance of water security?
- What values are suggested regarding climate change and poverty?
- What actions might you take in response to this media message?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?
- What questions do you have about this?

Writing Prompt for assessment in the sub-topic, *Poverty*

Draw evidence from the handout, the web pages and home websites from which these documents were taken to support or oppose this statement: "People living in the southern hemisphere are the most vulnerable to water insecurity as a result of climate change."

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested related to poverty, water and climate change? What evidence do you see in the document to support your analysis of the message?
Possible Answer: Doc 1: Water is the primary driver of climate change and poor people suffer most from climate-related water problems.
Evidence: Text: *Water is the primary medium through which climate change influences Earth's ecosystem…The poor, who are the most vulnerable, are likely to be adversely affected…Under present climate variability, water stress is already high, particularly in many developing countries.* Image*:* The cartoon of people living in a wood hut resting just beneath high lines for water and poverty.
Possible Answer: Doc 2: Water-related disasters impact poor people who are least responsible for the conditions leading to climate change.
Evidence: Text: *The poorest people and the poorest countries are being hit hardest by climate change. Yet they bear least responsibility for greenhouse gas emissions.*
Image*:* women climb down an embankment in dry terrain to collect water in a large bucket.

Question: What do these terms mean: "water stress" and "food insecurity"?
Water stress: not having access to clean drinking water
Food insecurity: not having access to affordable nutritious food

Media Literacy

Question: What techniques are used to underscore the importance of water security?
Possible Answers: Doc 1 The left hand menu includes tabs for "water resources management," "water quality," and "water security." The second paragraph begins: *Water resources and how they are managed impact almost all aspects of society and the economy* and goes on to list numerous ways that water insecurity is a problem for poor people. The cartoon underscores the connection between living in poverty and water insecurity.
Doc 2 The left hand menu includes tabs for "keeping rivers flowing," and "protecting oceans and coasts." The bullet listing of deadly effects of climate change includes several water-related problems. The photo shows how challenging it is for many people to get access to daily water needs.

Question: What values are suggested regarding climate change and poverty?
Possible Answers: Doc 1 suggests values of empathy for people living in poverty as indicated by the image of the woman living in a vulnerable home, caring for a child with a doll, values of service as indicated in the phrase "urgency for action" and values of determination as referenced in the line "progress toward poverty reduction targets."
Doc 2 suggests values of responsibility and compassion in the lead sentence saying that people living in conditions of poverty who are hit hardest by climate change are not themselves responsible for the greenhouse gas emissions driving climate change. The values of resilience and cooperation are implied in the photo of the women walking together to collect water from a dry riverbed.

Poverty and Climate Change

Reducing the Vulnerability of the Poor through Adaptation



prepared by:

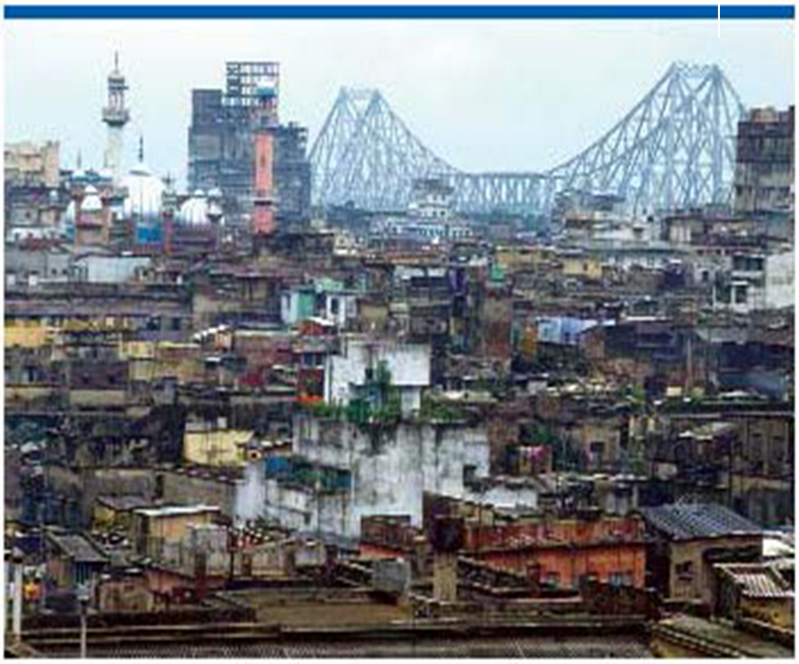
- African Development Bank
- Asian Development Bank
- Department for International Development, United Kingdom
- Directorate-General for Development, European Commission
- Federal Ministry for Economic Cooperation and Development, Germany
- Ministry of Foreign Affairs - Development Cooperation, The Netherlands
- Organization for Economic Cooperation and Development
- United Nations Development Programme
- United Nations Environment Programme
- The World Bank

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

Climate Change is Happening and Will Increasingly Affect the Poor

Today, it is widely agreed by the scientific community that climate change is already a reality. The Intergovernmental Panel on Climate Change (IPCC) has concluded that human activities are altering our climate system and will continue to do so. Over the past century, surface temperatures have increased and associated impacts on physical and biological systems are increasingly being observed. Science tells us that climate change will bring about gradual changes, such as sea level rise, and shifts of climatic zones due to increased temperatures and changes in precipitation patterns. Also, climate change is very likely to increase the frequency and magnitude of extreme weather events such as droughts, floods, and storms. While there is uncertainty in the projections with regard to the exact magnitude, rate, and regional patterns of climate change, its consequences will change the fate of many generations to come and particularly impact on the poor if no appropriate measures are taken.

The impacts of climate change, and the vulnerability of poor communities to climate change, vary greatly, but generally, climate change is superimposed on existing vulnerabilities. Climate change will further reduce access to drinking water, negatively affect the health of poor people, and will pose a real threat to food security in many countries in Africa, Asia, and Latin America. In some areas where livelihood choices are limited, decreasing crop yields threaten famines, or where loss of landmass in coastal areas is anticipated, migration might be the only solution. The macroeconomic costs of the impacts of climate change are highly uncertain, but very likely have the potential to threaten development in many countries.



Therefore, the task ahead is to increase the adaptive capacity of affected poor communities and countries.

1.2 Developing Countries Will Be Particularly Affected

The impacts of climate change vary across geographical regions (IPCC 2001b). (See Table 1).

Some of the anticipated impacts of climate change are positive (see IPCC 2001b). For example, water-scarce regions such as parts of Southeast Asia may benefit from increased water availability. However, developing countries are likely to suffer most from the negative impacts of climate change (IPCC 2001b). This is due to the economic importance of climate-sensitive sectors (for example, agriculture and fisheries) for these countries, and to their limited human, institutional, and financial capacity to anticipate and respond to the direct and indirect effects of climate change. In general, the vulnerability is highest for least developed countries (LDCs) in the tropical and subtropical areas. Hence, the countries with the fewest resources are likely to bear the greatest burden of climate change in terms of loss of life and relative effect on investment and the economy (IPCC 2001b).

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

Table 1
Impacts of Climate Change, Vulnerability, and Adaptive Capacity
Source: Adapted from IPCC 2001 b.

Region	Likely Regional Impacts of Climate Change	Vulnerability and Adaptive Capacity
Africa	Increase in droughts, floods, and other extreme events would add to stress on water resources, food security, human health, and infrastructure, constraining development. Changes in rainfall and intensified land use would exacerbate the desertification process (particularly in the Western Sahel and Northern and Southern Africa). Grain yields are projected to decrease, diminishing food security, particularly in small food-importing countries. Sea level rise would affect coastal settlements, flooding and coastal erosion, especially along the eastern Southern African coast. Major rivers are highly sensitive to climate variations and may experience decreases in run-off and water availability, affecting agriculture and hydropower systems, which may increase cross-boundary tensions. Increase in frequency of some extreme events in some places.	Adaptive capacity is low due to low GDP per capita, widespread poverty (the number of poor grew over the 1990s), inequitable land distribution, and low education levels. There is also an absence of social safety nets, in particular after harvest failures. Individual coping strategies for desertification are already strained, leading to deepening poverty. Dependence on rain-fed agriculture is high. More than one quarter of the population lives within 100 kilometers of the coast and most of Africa's largest cities are along coasts vulnerable to sea level rise, coastal erosion, and extreme events. Climate change has to be recognized as a major concern with respect to food security, water resources, natural resources productivity and biodiversity, human health, desertification, and coastal zones. Adaptive capacity will depend on the degree of civil order, political openness, and sound economic management.
Asia	Extreme events have increased in temperate Asia, including floods, droughts, forest fires, and tropical cyclones. Thermal and water stress, flood, drought, sea level rise, and tropical cyclones would diminish food security in countries of arid, tropical, and temperate Asia. Agriculture would expand and increase in productivity in northern areas. Reduced soil moisture in the summer may increase land degradation and desertification. Sea level rise and an increase in intensity of tropical cyclones would displace tens of millions of people in low-lying coastal areas of temperate and tropical Asia.	Adaptive capacity varies between countries depending on social structure, culture, economic capacity, and level of environmental degradation. Areas of concern include water and agriculture sectors, water resources, food security, biodiversity conservation and natural resource management, coastal zone management, and infrastructure. Capacity is increasing in some parts of Asia, for example the success of early warning systems for extreme weather events in Bangladesh, but is still constrained due to poor resource bases, inequalities in income, weak institutions, and limited technology.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

Latin America	Loss and retreat of glaciers would adversely impact runoff and water supply in areas where snowmelt is an important water resource. Floods and droughts would increase in frequency, and lead to poorer water quality in some areas. Increases in the intensity of tropical cyclones would change the risks to life, property, and ecosystems from heavy rain, flooding, storm surges, and wind damages. Coastal human settlements, productive activities, infrastructure, and mangrove ecosystems would be negatively affected by sea level rise.	Some social indicators have improved over the 1990s including adult literacy, life expectancy, and access to safe water. However, other factors such as high infant mortality, low secondary school enrolment, and high-income inequality contribute to limiting adaptive capacity. Areas of particular concern are agriculture, fisheries, water resource management, infrastructure, and health.
Small Island States	The projected sea level rise of 5 millimeters per year for the next 100 years would cause enhanced soil erosion, loss of land, poverty, dislocation of people, increased risk from storm surges, reduced resilience of coastal ecosystems, saltwater intrusion into freshwater resources, and high resource costs to respond to and adapt to changes. Coral reefs would be negatively affected by bleaching and by reduced calcification rates due to higher CO_2 levels; mangrove, sea grass bed, and other coastal ecosystems and the associated biodiversity would be adversely affected by rising temperatures and accelerated sea level rise.	Adaptive capacity of human systems is generally low in small island states, and vulnerability high; small island states are likely to be among the countries most seriously impacted by climate change. Areas of concern are food security, water resources, agriculture, biodiversity and coastal management, and tourism. Islands with very limited water supplies are highly vulnerable to the impacts of climate change on the water balance. Declines in coastal ecosystems would negatively impact reef fish and threaten reef fisheries, those who earn their livelihoods from reef fisheries, and those who rely on the fisheries as a significant food source. Limited arable land and soil salinization make agriculture of small islands, both for domestic food production and cash crop exports, highly vulnerable to climate change. Tourism, an important source of income and foreign exchange for many islands, would face severe disruption from climate change and sea level rise.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Poverty, Water & Climate Change

Pre-reading questions:

1. Before you read the text on climate change and poverty, take a moment and consider what you might know already about the topic. How will poor people around the world be impacted by water insecurity related to climate change?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. What are some of the water-related impacts of climate change in Africa?

4. What are some of the water-related impacts of climate change in Asia?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What are some of the water-related impacts of climate change in Latin America?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this report? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the source at the top of Table 1. How do the references affect your rating of the credibility of the overall report?

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

Natural Gas: Water & Climate Impacts

PowerPoint

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

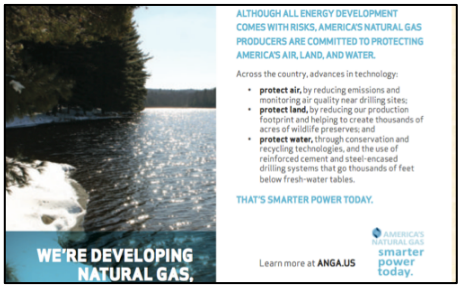
- Students will consider how natural gas extraction impacts fresh water resources.
- Students will reflect on the impact of economic decisions on local environments.
- Students will identify aspects of texts that reveal an author's purpose.
- Students will integrate visual information with other information in webpage texts.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.C
	ESS3.D
C3 Framework Social Studies Dimension 2 Concepts	D2.Eco.1.6-8
	D2.Geo.4.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RH.6-8.6
	CCSS.ELA-LITERACY.RH.6-8.7
	CCSS.ELA-LITERACY.WHST.6-8.1A

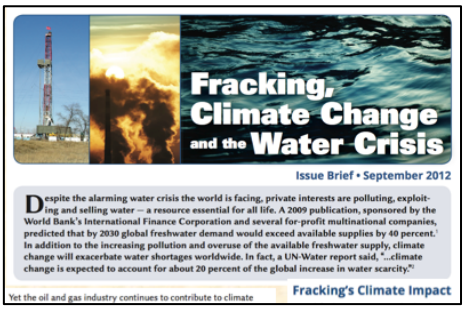
Vocabulary:

natural gas, fossil fuel, greenhouse gas, emissions, production footprint, drilling system, hydrofracking, aquifer, watershed

Media Type(s): advertisement, web page



We're Developing Natural Gas
Advertisement: America's Natural Gas Alliance, 2012



Fracking, Climate Change and the Water Crisis
Web page: Food & Water Watch, 2012

Preparation and Materials:

*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use Materials* section.

Preparation:
- Download and review the *How to Use Materials* section associated with this kit.

Materials for the Lesson:
- Two- page *Student Handout: Environmental impact of hydraulic fracturing*
- Two-page *Student Worksheet: Natural Gas Extraction Impacts*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions below based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the next page.

CONNECTIONS

Adapted from Project Look Sharp Lesson Source:
Media Constructions of Sustainability: Finger Lakes – Lesson 24: Hydrofracking, Media & Credibility

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Sustainability: Middle School – Energy Sources: Hydrofracking & Aquifers
Media Constructions of Sustainability: Middle School – Energy Sources: Hydrofracking Pros & Cons

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- How do increased demands for energy production impact local and global environments?
- How does natural gas production contribute to greenhouse gas emissions?

Social Studies

- How do the economic decisions regarding natural gas production impact society and the environment?
- How do cultural expectations of ready access to freshwater and fossil fuels influence environments and the daily lives of people living nearby and distant from these resources?

ELA

- What messages are suggested related to the environmental impact of natural gas production?
- What evidence do you see in the document to support your analysis of the message?
- Why might the creator of this document have chosen to represent natural gas production in this way?

Media Literacy

- Who might benefit from this message and who might be harmed by it?
- What information is left out of these documents that might be important to know?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?
- What questions do you have about this?

Writing Prompt for assessment in the sub-topic, *Natural Gas*

Draw evidence from the handout and the graphs to support to or to oppose this statement:
"Natural gas production is a good "bridge fuel" from a high carbon past powered by oil and coal to a low carbon future based in renewable energy sources."

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested related to the environmental impact of natural gas production? What evidence do you see in the document to support your analysis of the message?
Possible Answer: Doc 1: New natural gas production technologies protect air, land and water resources.
Evidence: Title: *We're developing natural gas while protecting natural resources;* Text: *advances in technology protect, air, land, water;* Image: A pristine lakeshore promises a clean environment.
Possible Answer: Doc 2: Hydrofracking technology for natural gas production contributes to climate change and water crisis concerns.
Evidence: Title: *Fracking, Climate Change and the Water Crisis;* Text: *the oil and gas industry continues to contribute to climate change and the water crisis by drilling and fracking for fossil fuels and siphoning off the water in our aquifers and watersheds;* Image: the left image of an gas drilling platform with a red flag on top signaling danger ties gas production to the disturbed water shown in the picture on the right.

Question: Why might the creator of this document have chosen to represent natural gas production in this way? NOTE: Possible answers based on brief online research.
Possible Answer: Doc 1: The American Natural Gas Alliance wants to highlight their perspective that hydrofracking is an environmentally safe technology that will help to meet energy needs while at the same time supporting their corporate goals.
Doc 2: Food and Water Watch states that its mission is to "stand up to corporations that put profits before people, and advocate for a democracy that improves people's lives and protects our environment." This webpage uses sharp imagery and combative language to demonstrate the producer's willingness to fight for environmental protection against "private interests" and "for-profit multi-national companies."

Media Literacy

Question: Who might benefit from this message and who might be harmed by it?
Possible Answer: Doc 1 might benefit the natural gas industry by suggesting that its products are environmentally safe and produced by the latest high technology advances. It might harm the opponents of natural gas and hydrofracking by making counterclaims to their allegations of environmentally unsound practices in the natural gas industry.
Doc 2 might benefit the opponents of natural gas and hydrofracking by exposing the dangers to water quality posed by the industry. It might harm the natural gas industry by suggesting that its products and practices harm the environment and "exacerbate water shortages worldwide."

Question: What information is left out of these documents that might be important to know?
Possible Answers: Doc 1 makes broad claims about how it protects air, land and water resources without providing specific examples of reports to back up the claims. For instance some researchers suggest that hydrofracking releases high levels of methane gas. Does this advertisement's suggestion that natural gas production reduces emissions take this research into account? **Doc 2** does not compare the natural gas industry's demand for water with that of other industries that are even more water-dependent like livestock and mining.

Not logged in Talk Contributions Create account Log in

Article Talk Read Edit View history Search

WIKIPEDIA
The Free Encyclopedia

Main page
Contents
Featured content
Current events
Random article
Donate to Wikipedia
Wikipedia store

Interaction
Help
About Wikipedia
Community portal
Recent changes
Contact page

Tools
What links here
Related changes
Upload file
Special pages
Permanent link
Page information
Wikidata item
Cite this page

Print/export
Create a book
Download as PDF
Printable version

Languages
Add links

Environmental impact of hydraulic fracturing

From Wikipedia, the free encyclopedia

The **environmental impact of hydraulic fracturing** affects land use and water consumption, methane emissions,[1] air emissions, water contamination, noise pollution, and health. Water and air pollution are the biggest risks to human health from hydraulic fracturing. Research is underway to determine if human health has been affected, and rigorous adherence to regulation and safety procedures is required to avoid harm.[2] Noise from hydraulic fracturing and associated transport can also affect residents and local wildlife.

Hydraulic fracturing fluids include proppants and other substances, which may include toxic chemicals.[3] In the United States, such additives may be treated as trade secrets by companies who use them. Lack of knowledge about specific chemicals has complicated efforts to develop risk management policies and to study health effects.[4][5] In other jurisdictions, such as the United Kingdom, these chemicals must be made public and their applications are required to be nonhazardous.[6]

Water usage by hydraulic fracturing can be a problem in areas that experience water shortage. Surface water may be contaminated through spillage and improperly built and maintained waste pits, in jurisdictions where these are permitted.[7] Further, ground water can be contaminated if fluid is able to escape during fracking. Produced water, the water that returns to the surface after fracking, is managed by underground injection, municipal and commercial wastewater treatment, and reuse in future wells. [8] There is potential for methane to leak into ground water and the air, though escape of a methane is a bigger problem in older wells than in those built under more recent legislation.[9]

Hydraulic fracturing causes induced seismicity called microseismic events or microearthquakes. The magnitude of these events is too small to be detected at the surface, being of magnitude M-3 to M-1 usually. However, fluid disposal wells (which are often used in the USA to dispose of polluted waste from several industries) have been responsible for earthquakes up to 5.6M in Oklahoma and other states.[10]

Governments worldwide are developing regulatory frameworks to assess and manage environmental and associated health risks, working under pressure from industry on the one hand, and from anti-fracking groups on the other.[11][12]:3–7 In some countries like France a precautionary approach has been favored and hydraulic fracturing has been banned.[13][14] Some countries such as the United States have adopted the approach of identifying risks before regulating.[*citation needed*] The United Kingdom's regulatory framework is based on conclusion that the risks associated with hydraulic fracturing are manageable if carried out under effective regulation and if operational best practices are implemented.[11]

Hydraulic fracturing



Shale gas drilling rig near Alvarado, Texas

By country
Canada · New Zealand · South Africa · United Kingdom · United States

Environmental impact
Additives · United States

Regulation
United States exemptions

Technology
Proppants · Uses of radioactivity

Politics
2012-14 Romanian protests · Anti-fracking movement · *FrackNation* · Frack Off · *Gasland*

V · T · E

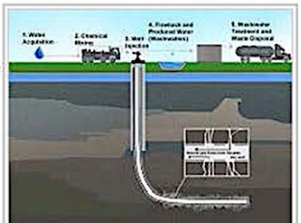


Illustration of hydraulic fracturing and related activities

Contents [hide]

1 Air emissions
1.1 Climate change
2 Water consumption
3 Water contamination
3.1 Injected fluid
3.2 Flowback
3.3 Surface spills
3.4 Methane
4 Radionuclides
5 Land usage
6 Seismicity
6.1 Induced seismicity from hydraulic fracturing
6.2 Induced seismicity from water disposal wells
7 Noise
8 Safety issues
9 Health risks
10 Policy and science
11 See also
12 References
13 Bibliography

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

Climate change [edit]

Whether natural gas produced by hydraulic fracturing causes higher well-to-burner emissions than gas produced from conventional wells is a matter of contention. Some studies have found that hydraulic fracturing has higher emissions due to methane released during completing wells as some gas returns to the surface, together with the fracturing fluids. Depending on their treatment, the well-to-burner emissions are 3.5%–12% higher than for conventional gas.[19]

A debate has arisen particularly around a study by professor Robert W. Howarth finding shale gas significantly worse for global warming than oil or coal.[20] Other researchers have criticized Howarth's analysis,[21][22] including Cathles *et al.*, whose estimates were substantially lower."[23] A 2012 industry funded report co-authored by researchers at the United States Department of Energy's National Renewable Energy Laboratory found emissions from shale gas, when burned for electricity, were "very similar" to those from so-called "conventional well" natural gas, and less than half the emissions of coal.[8]

Several studies which have estimated lifecycle methane leakage from shale gas development and production have found a wide range of leakage rates, from less than 1% of total production to 10%.[24][25][26] According to the Environmental Protection Agency's Greenhouse Gas Inventory a methane leakage rate is about 1.4%.[27] The American Gas Association , an industry trade group, calculated a 1.2% leakage rate.[28] The most comprehensive study of methane leakage from shale gas to date, initiated by the Environmental Defense Fund and released in the Proceedings of the National Academy of Sciences on September 16, 2013, finds that fugitive emissions in key stages of the natural gas production process are significantly lower than estimates in the EPA's national emissions inventory. The study reports direct measurements from 190 onshore natural gas sites, all hydraulically fractured, across the country and estimates a leakage rate of 0.42% for gas production.[24]

References [edit]

1. ^ http://www.mintpressnews.com/2500-square-mile-methane-plume-silently-hovering-western-us/200313/
2. ^ a b Public Health England. 25 June 2014 PHE-CRCE-009: Review of the potential public health impacts of exposures to chemical and radioactive pollutants as a result of shale gas extraction ISBN 978-0-85951-752-2
3. ^ a b c d Chemicals Used in Hydraulic Fracturing (PDF) (Report). Committee on Energy and Commerce U.S. House of Representatives. April 18, 2011.
4. ^ a b Healy 2012
5. ^ a b Hass, Benjamin (14 August 2012). "Fracking Hazards Obscured in Failure to Disclose Wells". *Bloomberg News*. Retrieved 27 March 2013.
6. ^ a b "Developing Onshore Shale Gas and Oil – Facts about 'Fracking'" (PDF). Department of Energy and Climate Change. Retrieved 14 October 2014.
7. ^ a b Walter, Laura (22 May 2013). "AIHce 2013: Investigating Surface Spills in the Fracking Industry". Penton. EHSToday.
8. ^ a b c Logan, Jeffrey (2012). Natural Gas and the Transformation of the U.S. Energy Sector: Electricity (PDF) (Report). Joint Institute for Strategic Energy Analysis. Retrieved 27 March 2013.
9. ^ a b c d Broomfield 2012
10. ^ a b c "Man-Made Earthquakes Update". United States Geological Survey. 2014-01-17. Retrieved 2014-03-30.
11. ^ a b c d "Shale gas extraction: Final report". The Royal Society. 29 June 2012. Retrieved 10 October 2014.

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Natural Gas Extraction Impacts

Pre-reading questions:

1. Before you read the text on the environmental impacts of hydrofracking for natural gas extraction, take a moment and consider what you might know already about the topic. How does hyfrofracking affect water and climate?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. What are some of the main environmental impacts of hydraulic fracturing?

4. What are some of the major ways in which freshwater resources are impacted by hydrofracking?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What does the author mean when they say that the relative releases of greenhouse gases from hydrofracking compared to conventional wells is "a matter of contention?"

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

Video

El Nino: Connections to Global Warming

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

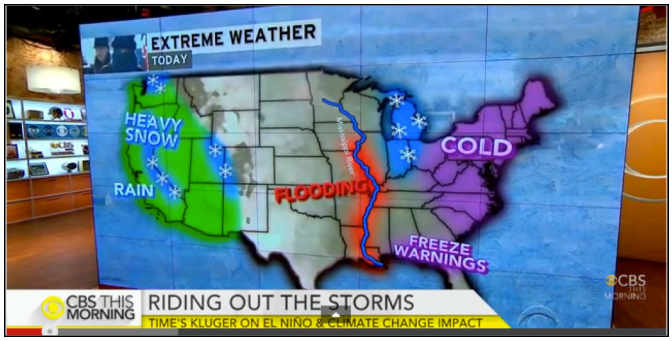
- Students will consider patterns of ocean warming during an El Nino year and the subsequent impacts on worldwide weather.
- Students will reflect on the impact of El Nino on human settlements.
- Students will read and analyze visual and print information in diverse texts related to the interconnections between El Nino and climate change.
- Students will identify aspects of video construction that reveal a filmmaker's purpose.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS2.C
	ESS2.D
C3 Framework Social Studies Dimension 2 Concepts	D2.Geo.2.6-8
	D2.Geo.8.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RST.6-8.1
	CCSS.ELA-LITERACY.RST.6-8.6
	CCSS.ELA-LITERACY.RST.6-8.7

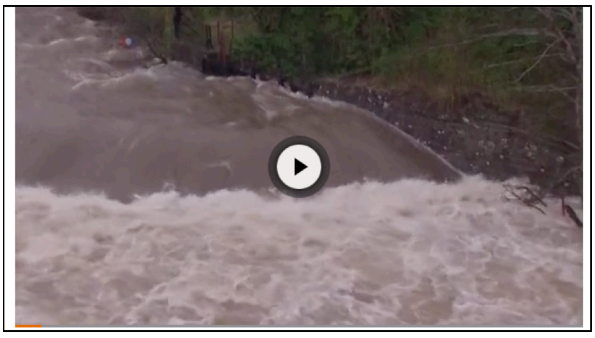
Vocabulary:

El Nino, global warming, climate change, food insecurity, extreme weather, national security, Paris climate accords, Arctic sea ice loss,

Media Type(s): TV video news report



El Niño and its impact on climate change
TV video news report, CBS, 2016
4:03 min.



Global Warming, El Niño Combine to Fuel Extreme World Weather, TV video news report, Voice of America, 2016
2:52 min.

Preparation and Materials:
*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use These Materials* section.

Preparation:
- Download and review the *How to Use These Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: What is an El Nino?*
- Two-page *Student Worksheet: The Science Behind El Nino*
- Two videos

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the two film clips. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Global Warming – Lesson 5: Severe Weather

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- What are the conditions that create an El Nino?
- What is the impact of El Nino events occurring during a period of global climate change?

Social Studies

- How do scientists use mapping techniques to predict and chart an El Nino?
- What are some of the impacts of El Nino on human settlements?

ELA

- What messages are suggested about the impacts of El Nino on human and natural systems?
- What evidence do you see in the video to support your analysis?
- How do the men interviewed differ in their descriptions of the interconnections between extreme weather events and global warming?

Media Literacy

- What techniques does the filmmaker use to convey their message?
- What are the sources of information and are they credible?
- What actions might you take in response to this media message?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?
- What questions do you have about this?

Writing Prompt for Synthesis Assessment in the Sub-Topic, *El Nino*

Draw evidence from the handout and the videos to write about this question: "Why is it important to know about the combined impacts of global climate change and El Nino events?"

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested about the impacts of El Nino on human and natural systems? What evidence do you see in the video to support your analysis?
Possible Answer: Doc 1: El Nino warms Pacific waters resulting in extreme precipitation and droughts in the Western hemisphere which cause food insecurity and threaten health.
Evidence: The maps and graphic show that El Nino creates unusually warm water in the Equatorial Pacific and warmer temperatures n the northern U.S. Images of people carrying water containers and of flooded rivers underscore the impacts of droughts and floods. Most of the information comes from the interview with the *Time* magazine editor.
Doc 2: El Nino causes extreme weather events forcing people to flee their homes and causing polar bears to lose habitat.
Evidence: Images of storm and flood damage highlight the impact on communities and river habitats. Images of icebergs and polar bears illustrate the concern for loss of Arctic sea ice. The three men interviewed add information about concerns related to climate change, polar impacts and threats to species.

Question: How do the men interviewed differ in their descriptions of the interconnections between extreme weather events and global warming?
Possible Answer: Doc 1: The *Time* editor stresses that not all extreme weather impacts are related to global warming saying, "Scientists are acknowledging that not every single weather event is linked to climate change." He goes on to say that climate change is real and its causes must be dealt with if we are to adapt the impacts of climate change.
Doc 2: The *Weather Underground* meteorologist is direct in linking extreme weather events and climate change saying, "Now with a warmer atmosphere you've got more energy to power bigger storms so when it does rain you're going to see more of those high end societal impactful events."

Media Literacy

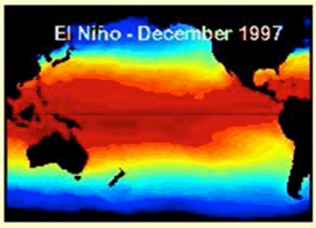
Question: What techniques does the filmmaker use to convey their message?
Possible Answers: Doc #1: The producer intersperses an interview with a journalist with maps, charts, still photos and news video to break up the commentary with visual imagery.
Doc 2: The producer chooses to have a single off-air narrator tell the story using news and stock video and images of global maps interspersed with interviews of three individuals, each speaking to a different aspect of the story.

Question: What are the sources of information and are they credible?
Possible Answers: Doc 1 relies on information from Jeffery Kluger, an editor from *Time* magazine, who is described as overseeing science and human behavior coverage. Most of the information comes from CBS journalists interviewing another journalist. Two government agencies, NOAA and NASA, are credited with the graphics.
Doc 2 relies on information from an unseen and unnamed narrator who twice says, "some climate observers say" without identifying who these observers are. The story also includes interviews with a meteorologist, a blogger and a scientist associated with a nonprofit organization. Neither of these reports is particularly credible when it comes to direct information from a clearly identified scientific organization.

El Niño Theme Page

access to distributed information on El Niño

What is an El Niño?



El Niño is characterized by unusually warm ocean temperatures in the Equatorial Pacific, as opposed to La Niña, which characterized by unusually cold ocean temperatures in the Equatorial Pacific. El Niño is an oscillation of the ocean-atmosphere system in the tropical Pacific having important consequences for weather around the globe.

Among these consequences are increased rainfall across the southern tier of the US and in Peru, which has caused destructive flooding, and drought in the West Pacific, sometimes associated with devastating brush fires in Australia. Observations of conditions in the tropical Pacific are considered essential for the prediction of short term (a few months to 1 year) climate variations.

To provide necessary data, NOAA operates a network of buoys which measure temperature, currents and winds in the equatorial band. These buoys daily transmit data which are available to researchers and forecasters around the world in real time.

NOTE: Until 1997, the 1982-1983 El Niño, was the largest El Niño of the twentieth century. These two important El Niño events are used for illustrations in this web page.

In normal, non-El Niño conditions (top panel of schematic diagram), the trade winds blow towards the west across the tropical Pacific. These winds pile up warm surface water in the west Pacific, so that the sea surface is about 1/2 meter higher at Indonesia than at Ecuador.

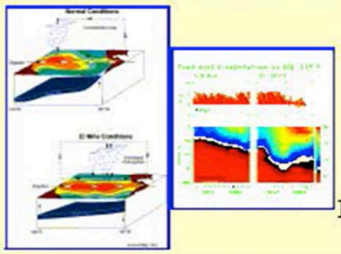
Read more on:

- Recognizing an El Niño
- El Niño animations
- Historical El Niños
- Watch the 2009-2010 El Nino, the strongest Central-Equatorial Pacific El Nino in the past 3 decades. **YouTube Video**
- Developing an El Niño Observing System - **YouTube Video**

Related sites:

- What is La Niña?
- Children of the Tropics: El Niño and La Niña
- Today's El Niño and La Niña information *Updated daily!*

Click for full size image (will open a new browser window)



(a) (b)

(a) Schematic diagram of normal El Niño conditions in the Pacific Ocean, and (b) temperature on the Equator at 110W

The sea surface temperature is about 8 degrees C higher in the west, with cool temperatures off South America, due to an upwelling of cold water from deeper levels. This cold water is nutrient-rich, supporting high levels of primary productivity, diverse marine ecosystems, and major fisheries. Rainfall is found in rising air over the warmest water, and the east Pacific is relatively dry. The observations at 110 W (left diagram of 110 W conditions) show that the cool water (below about 17 degrees C, the black band in these plots) is within 50m of the surface.

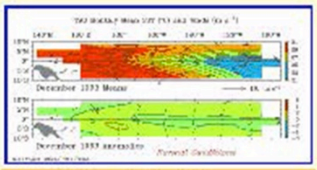
During El Niño (bottom panel of the schematic diagram), the trade winds relax in the central and western Pacific leading to a depression of the thermocline in the eastern Pacific, and an elevation of the thermocline in the west. The observations at 110W show, for example, that during 1982-1983, the 17-degree isotherm dropped to about 150m depth. This reduced the efficiency of upwelling to cool the suface and cut off the supply of nutrient rich thermocline water to the euphotic zone. The result was a rise in sea surface temperature and a drastic decline in primary productivity, the latter of which adversely affected higher trophic levels of the food chain, including commercial fisheries in this region. The weakening of easterly tradewinds during El Niño is evident in this figure as well. Rainfall follows the warm water eastward, with associated flooding in Peru and drought in Indonesia and Australia. The eastward displacement of the atmospheric heat source overlaying the warmest water results in large changes in the global atmospheric circulation, which in turn force changes in weather in regions far removed from the tropical Pacific.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

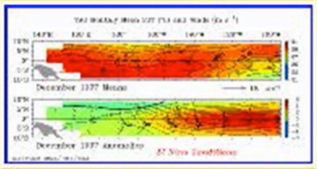
Recognizing El Niño

El Niño can be seen in Sea Surface Temperature in the Equatorial Pacific Ocean

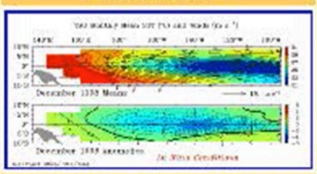
El Niño can be seen in measurements of the sea surface temperature, such as those shown above, which were made from the TAO Array of moored buoys. In December 1993, the sea surface temperatures and the winds were near normal, with warm water in the Western Pacfic Ocean (in red on the top panel of December 1993 plot), and cool water, called the "cold tongue" in the Eastern Pacific Ocean (in green on the top panel of the December 1993 plot). The winds in the Western Pacific are very weak (see the arrows pointing in the direction the wind is blowing towards), and the winds in the Eastern Pacific are blowing towards the west (towards Indonesia). The bottom panel of the December 1993 plot shows anomalies, the way the sea surface temperature and wind differs from a normal December. In this plot, the anomalies are very small (yellow/green), indicating a normal December. December 1997 was near the peak of a strong El Niño year. In December 1997, the warm water (red in the top panel of the December 1997 plot) has spread from the western Pacific Ocean towards the east (in the direction of South America), the "cold tongue" (green color in the top panel of the December 1997 plot) has weakened, and the winds in the western Pacific, usually weak, are blowing strongly towards the east, pushing the warm water eastward. The anomalies show clearly that the water in the center of Pacific Ocean is much warmer (red) than in a normal December.



Normal Conditions - December 1993



El Niño (warm) Conditions - December 1997



La Niña (cold) Conditions - December 1998

Also see the entire Pacific Ocean

December 1998 was a strong La Niña (cold) event. The cold tongue (blue) is cooler than usual by about 3° Centigrade. The cold La Niña events sometimes (but not always) follow El Niño events.

Animation of El Niño

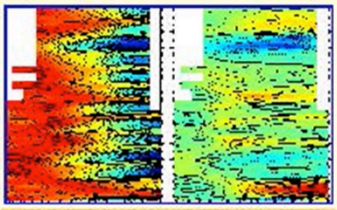
Animation of physical processes allow scientists to better understand El Niño

If you have an MPEG animation viewer, and sufficient memory, you can view an animation of El Niño which shows the changes in monthly sea surface temperature in the tropical Pacific Ocean. The animation is about 1 Megabyte in size. As you view this animation, you will see the warm water spreading from the western Pacific to the eastern Pacific during 1997. The bottom panel in the animation, labeled anomalies, shows how much the sea surface temperature for each month is different from the long term average for that month. The red color in the anomalies plot indicates that the temperature of the water is much warmer than is normal for that month. Blue color indicates that the water is much cooler than is normal for that month

Historical El Niños

Recent and historical El Niños can be seen in Pacific Sea Surface Temperature representations

Click for full size image (will open a new browser window)



Mean and anomalies of sea surface temperature from 1986 to the present. Notice historical El Niños in 1986-1987, 1991-1992, 1993, 1994 and 1997

In the left hand panel, you see the sea surface temperature at the Equator in the Pacific Ocean (Indonesia is towards the left, South America is towards the right). Time is increasing downwards from 1986 at the top of the plot, to the present, at the bottom of the plot. The first thing to note is the blue "scallops" on the right of the plot, in the eastern Pacific. These indicate the cool water typically observed in the Eastern Pacific (called the "cold tongue"). Cold tongue temperatures vary seasonally, being warmest in the northern hemisphere springtime and coolest in the northern hemisphere fall. The red color on the left is the warm pool of water typically observed in the western Pacific Ocean. El Niño is an exaggeration of the usual seasonal cycle. During the El Niño in 1986-1987, you can see the warm water (red) penetrating eastward in the Spring of 1987. There is another El Niño in 1991-1992, and you can see the warm water penetrating towards the east in the northern hemisphere spring of 1992. The El Niño in 1997-1998 is a very strong El Niño. El Niño years are easier to see in the anomalies on the right hand panel. The anomalies show how much the sea surface temperature is different from the usual value for each month. Water temperatures significantly warmer than the norm are shown in red, and water temperatures cooler than the norm are shown in blue.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

In the right-hand plot of sea surface temperature anomalies, it is very easy to see El Niños, with water warmer than usual (red) in the eastern Pacific, during in 1986-1987, 1991-1992, 1993, 1994 and 1997-1998. Notice the very cool water (blue), in the Eastern Pacific, in 1988-1989. This is a strong La Niña, which occurs after some (but not all) El Niño years. 1995-1996 was a weaker La Niña year. It is unusual for El Niños to occur in such rapid succession, as has been the case during 1990-1994.

Selected references

Selected papers on El Niño and La Niña

- Up-to-date El Niño references: TAO refereed journal articles and other TAO papers
- Australian Academy of Science El Niño web site
- Historical references:
  - Philander, S.G.H., 1990: El Niño, La Niña and the Southern Oscillation. Academic Press, San Diego, CA, 289 pp.
  - Hayes, S.P., L.J. Mangum, J. Picaut, A. Sumi, and K. Takeuchi, 1991: TOGA-TAO: A moored array for real-time measurements in the tropical Pacific Ocean. Bull. Am. Meteorol. Soc., 72, 339-347. (abstract available)
  - McPhaden, M.J., 1993: TOGA-TAO and the 1991-93 El Niño-Southern Oscillation Event. Oceanography, 6, 36-44. (entire paper available)
- Reports to the Nation - El Niño and Climate Prediction

Credits and Acknowledgements | TAO Diagrams

Information on the names El Niño and La Niña

El Niño was originally recognized by fisherman off the coast of South America as the appearance of unusually warm water in the Pacific ocean, occurring near the beginning of the year. El Niño means The Little Boy or Christ child in Spanish. This name was used for the tendency of the phenomenon to arrive around Christmas.

La Niña means The Little Girl. La Niña is sometimes called El Viejo, anti-El Niño, or simply "a cold event" or "a cold episode". El Niño is often called "a warm event".

There has been a confusing range of uses for the terms El Niño, La Niña and ENSO by both the scientific community and the general public, which is clarified in this web page on definitions of the terms ENSO, Southern Oscillation Index, El Niño and La Niña. Also interesting is the Web page: Where did the name El Niño come from?

Department of Commerce / National Oceanic and Atmospheric Administration
Pacific Marine Environmental Laboratory / Tropical Atmosphere Ocean Project
Disclaimer | Privacy Policy | Feedback: oar.pmel.taogroup@noaa.gov

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- The Science Behind El Nino

Pre-reading questions:

1. Before you read the text on El Nino, take a moment and consider what you might know already about the topic. How do scientists identify an El Nino period?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. What creates an El Nino period?

4. How do maps help scientists recognize and predict El Nino events?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What are some of the consequences for global weather as a result of El Nino?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

PowerPoint

Extreme Weather: Climate Change Connections & Water

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

- Students will consider the relationship between climate change and extreme weather.
- Students will reflect on the ways in which climate change may impact global patterns of settlement and movement.
- Students will cite evidence to support analysis of text and images related to extreme weather and climate change.
- Students will identify primary source attributions in secondary source texts.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS3.B
	ESS3.D
C3 Framework Social Studies Dimension 2 Concepts	D2.Geo.2.6-8
	D2.Geo.8.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RST.6-8.1
	CCSS.ELA-LITERACY.RST.6-8.7
	CCSS.ELA-LITERACY.RH.6-8.2

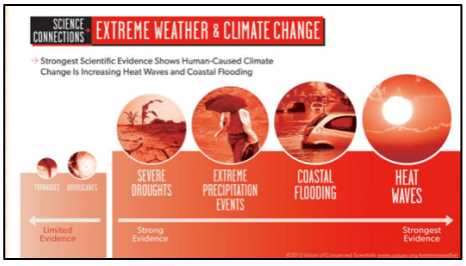
Vocabulary:

extreme weather, climate change, greenhouse gas emissions, heat wave, drought, coastal flooding, scientific evidence

Media Type(s): web pages



Extreme weather already on increase
Web page: The Guardian, 2015



Extreme Weather & Climate Change
Web page: Union of Concerned Scientists, 2016

Preparation and Materials:

*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use Materials* section.

Preparation:
- Download and review the *How to Use Materials* section associated with this kit.

Materials for the Lesson:
- Four-page *Student Handout: Current Extreme Weather & Climate Change*
- Two-page *Student Worksheet: Extreme Weather & Climate Change*
- Five-slide PowerPoint

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the three PowerPoint slide images. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Connections to Project Look Sharp Lesson Resources:

Media Constructions of Resource Depletion – Lesson 1: Slides 37, 39, 40, 41
Media Constructions of Sustainability: Finger Lakes – Lesson 21: Climate Change, Agriculture & Sustainability
Media Constructions of Global Warming – Lesson 1: Framing the Debate
Media Constructions of Global Warming – Lesson 5: Agriculture
Media Constructions of Global Warming – Lesson 5: Severe Weather

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- What are some probabilities that are cited to confirm the link between extreme weather and climate change?
- What types of extreme weather events are more likely to occur due to global climate change?

Social Studies

- How are graphics and photos used to explain relationships between extreme weather events and climate change?
- How might climate change impact global patterns of settlement and movement?

ELA

- What messages are suggested related to extreme weather and climate change?
- What evidence do you see in the document to support your analysis of the message?
- What are the primary source documents that provided the information in these secondary sources?

Media Literacy

- Why might the producers have chosen these visual techniques to to convey the message?
- What actions might you take in response to this media message?
- How credible is this and why do you think that?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?
- What questions do you have about this?

Writing Prompt for assessment in the sub-topic, *Extreme Weather*

Draw evidence from the handout, the web pages and from the primary sources referenced to support or oppose this statement: "Large areas of the earth will become increasingly uninhabitable in the future due to human-induced climate change."

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested related to extreme weather and climate change? What evidence do you see in the document to support your analysis of the message?
Possible Answer: Doc 1: Climate change makes heat waves and extreme rainfall more likely.
Evidence: Title: *Extreme weather already on increase due to climate change;* Text: *Extreme heatwaves and heavy rain storms are already happening with increasing regularity worldwide because of manmade climate change, according to new research.* Image*:* The photo of the cars in the trees above the water conveys one possible result of extreme rainfall due to climate change.
Possible Answer: Doc 2: Climate change is likely to produce more heat waves and coastal flooding than other types of extreme weather events.
Evidence: Title: *Strongest scientific evidence shows human-caused climate change is increasing heat waves and coastal flooding*; Image: *the largest circles on the right hand side of the graphic with the "strongest evidence" arrow are for coastal flooding and heat waves.*

Question: What are the primary source documents that provided the information in these secondary sources?
Answer: Doc 1: Shown in the blue link in the second sentence – A study published in the journal *Nature Climate Change ("*Anthropogenic contribution to global occurrence of heavy-precipitation and high-temperature extremes")
Possible Answer: Doc 2: Shown in bottom right textbox- The Intergovernmental Panel on Climate Change SREX Report for 2012 (SREX - Special Report: Managing the Risks of Extreme Events and. Disasters to Advance Climate Change Adaptation)

Media Literacy

Question: Why might the producers have chosen these visual techniques to convey the message?
Possible Answers: Doc 1 British readers of the *Guardian* might relate to the images of the cars in a creek in a residential neighborhood in neighboring France.
Doc 2 The images of the hot sun, cars underwater, a man with an umbrella and a parched field are familiar images, easy for people to understand and relate to as compared to statistics or a graph without images. The use of dramatic red to indicate strong evidence and predicted events is often used to represent "Stop" and "Danger" warnings.

Question: What actions might you take in response to this media message?
Possible Answers: Doc 1 Readers might click on the link to the original study in *Nature Climate Change* to learn more from the primary source. They might do research to see if local or regional extreme weather events where they live have been tied to climate change. They might gather with others in their community to discuss how to become resilient in the face of predicted extreme weather patterns.
Doc 2 Readers might seek out the IPCC report on which this graphic was based to learn more about climate change adaptations to account for extreme weather events. They might study more of the Union of Concerned Scientist materials related to climate change. They might join or start a local UCS study group to help protect and prepare communities on the front lines of climate change.

CLIMATE COMMUNICATION
SCIENCE & OUTREACH

Who We Are | What We Do | What's New | Resources | Our Climate is Changing | How it Will Affect Us | What We Can Do

Home | What's New | Features | Current Extreme Weather & Climate Change | Overview

WHAT'S NEW
- News
- Common Climate Questions
- Features
  - Summer of Extremes
    - Roundup of Summer Records
  - Heat Waves and Climate Change
    - Overview
    - Looking Forward
    - Heat Waves: The Details
    - Heat Waves and Wildfires
    - References
    - Download Full PDF
  - Current Extreme Weather & Climate Change
    - Overview
    - Heat Waves
    - Reduced Cold
    - Precipitation, Floods and Drought
    - Floods
    - Drought
    - Circulation Changes: El Niño and the Arctic Oscillation
    - Hurricanes and Other Summer Storms
    - Winter Storms
    - Conclusion
    - References
    - Download Full PDF
- Archive

NEWS ARCHIVE

TWITTER: CLIMATECOMMS
- London underground at high risk of flooding due to climate change

Overview

Current Extreme Weather & Climate Change

Climate Communication hosted a press conference featuring our expert reviewers discussing the connections between extreme weather and climate change. The full audio recording of the conference can be downloaded here: 9/7/11 Climate Communication Press Conference.

Expert Reviewers:

- Kevin Trenberth, National Center for Atmospheric Research
- Jerry Meehl, National Center for Atmospheric Research
- Jeff Masters, Weather Underground
- Richard Somerville, Scripps Institution of Oceanography, University of California, San Diego

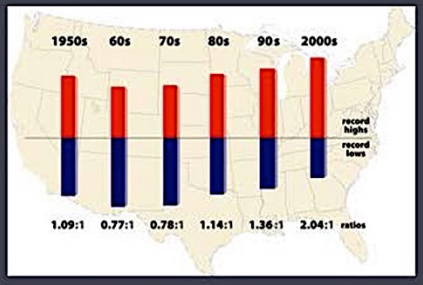
Editorial Team for Climate Communication:

- Hunter Cutting
- Sandra Chung
- Susan Hassol

Recent weather events such as deadly heat waves and devastating floods have sparked popular interest in understanding the role of global warming in driving extreme weather. These events are part of a new pattern of more extreme weather across the globe, shaped in part by human-induced climate change.

As the climate has warmed, some types of extreme weather have become more frequent and severe in recent decades, with increases in extreme heat, intense precipitation, and drought. Heat waves are longer and hotter. Heavy rains and flooding are more frequent. In a wide swing between extremes, drought, too, is more intense and more widespread.

Record Highs Now Outpace Record Lows by 2:1



The ratio of record daily high temperatures to record daily lows observed at about 1,800 weather stations in the 48 contiguous United States from January 1950 through September 2009.

Meehl et al. 2009

All weather events are now influenced by climate change because all weather now develops in a different environment than before. While natural variability continues to play a key role in extreme weather, climate change has shifted the odds and changed the natural limits, making certain types of extreme weather more frequent and more intense. The kinds of extreme weather events that would be expected to occur more often in a warming world are indeed increasing.

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Science

http://t.co/NDTb1tA5pF
about 8 minutes ago from Tweue
Reply Retweet Favorite

- Sorry, feds: Kids can sue over climate negligence, judge says
http://t.co/9ZcAnP3dN8
about 38 minutes ago from Tweue
Reply Retweet Favorite

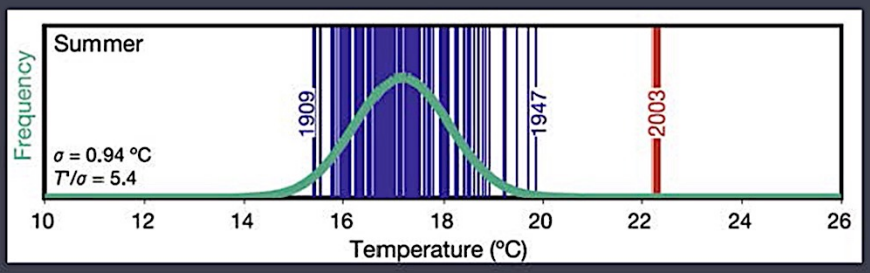
- Two German states already 100 percent renewable for electricity
http://t.co/ylncGMHDs
about 55 minutes ago from Twitter Web Client
Reply Retweet Favorite

Follow @climatecomms 7,062 followers

For example, 60 years ago in the continental United States, the number of new record high temperatures recorded around the country each year was roughly equal to the number of new record lows. Now, the number of new record highs recorded each year is twice the number of new record lows, a signature of a warming climate, and a clear example of its impact on extreme weather.[1]

The increase in record highs extends outside the U.S. as well. A similar two to one ratio of record highs to record lows recently has been observed in Australia.[2] Over the past decade, 75 counties set all-time record highs but only 15 countries set all-time record lows. In 2010, 19 countries set new all-time record high temperatures, but not a single country set a new all-time record low (among those countries keeping these statistics).[3]

European 2003 Summer Temperatures Were Far Outside Normal Range



2003 European Heat Wave: The Hottest Summer in 140 Years (1864-2003). Each vertical line represents the average summer temperature for a single year from the average of four locations in Switzerland over the period 1864 through 2003. This illustrates how far outside the normal range the summer of 2003 was.

SchŠr et al. 2004

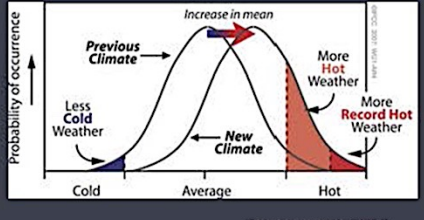
One way in which climate change is connected to individual events such as heat waves and heavy rains is by increasing the odds they will occur. We witness that connection in the form of more frequent extreme events. Analyzing how global warming has changed the odds for a specific event has been done for standout moments such as the European heat wave of 2003 that killed tens of thousands. Based on temperature records from 1864 to 2002, the odds of such a heatwave occurring are about 1 in 10 million.[4] An event like the 2003 heatwave becomes much more likely after factoring in the observed warming of 2¡F over Europe and increased weather variability.[5] In addition, comparing computer models of climate with and without human contribution shows that human influence has roughly quadrupled the odds of a European summer as hot as or hotter than the summer of 2003.[6]

A Small Increase in Average Temperature Leads to Big Changes in Extreme Weather

Small changes in the averages of many key climate variables can correspond to large changes in weather.[7] Substantial changes in the frequency and intensity of extreme events can result from a relatively small shift in the average of a distribution of temperatures, precipitation, or other climate variables.[8]

Weather variation on our planet can be described with a rough bell-shaped curve. So-called normal weather is very common while extreme weather is rare. While events close to normal occur frequently, in the broad center of the curve, there is a sharp fall-off in the frequency of events further away from normal, in the flatter ends of the curve. For instance, a small increase in temperature shifts the entire curve toward hotter high temperatures. The rarest and most extreme record heat events become even more severe and much more frequent. Precipitation does not follow quite the same pattern, but the same concept applies: fewer light and moderate rains are being replaced by more heavy rain events.

Climate Change Shifts the Odds for Extreme Weather Events



Solomon et al. 2007

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Science

While our understanding of how climate change affects extreme weather is still developing, evidence suggests that extreme weather may be affected even more than anticipated. Changes in precipitation are quite complex,[9] and current computer models of climate have only a limited ability to predict the heaviest precipitation. Recent observed changes in precipitation have been even greater than the changes projected by climate models.[10] Even with their limitations, current models still capture the physical processes associated with the observed increases in intense precipitation. Warmer air holds more moisture. That additional moisture fuels increases in precipitation intensity. This has been been measured in real-world observations as well as simulated by climate models.[11]

Humans Contribute to Extreme Weather Ð and Suffer its Consequences

Rigorous analyses have shown that natural variability alone cannot explain the observed long-term trends of changing extremes in temperature and precipitation.[12]

In contrast, the observed trends fit well with our understanding of how climate change drives changes in weather. Computer models of the climate that include both natural forces as well as human influences are consistent with observed global trends in heat waves, warm days and nights, and frost days over the last four decades.[13] Human influence has also been shown to have contributed to the increase of heavy precipitation over the Northern Hemisphere.[14]

Extreme weather events do not have a single cause but instead have various possible contributing factors Ð and human-induced climate change is now one of those factors.

Weather variability can be extremely costly. One estimate finds that the total U.S. economic output varies by up to $485 billion/year owing to weather variability.[15] From 1980 to 2010 there were 99 weather disasters in the U.S. in which damages exceeded $1 billion. Altogether those disasters cost $725 billion.[16] In 2011, the costs of all weather-disaster damages so far has climbed past $35 billion, according to NOAA estimates. As of August 30th, the U.S. has witnessed 10 weather disasters costing over $1 billion each. This breaks the previous record for the number of such U.S. weather disasters in an entire year.[17]

Changes in extreme weather threaten human health as well as prosperity. Many societies have taken measures to cope with historical weather extremes, but new, more intense extremes have the potential to overwhelm existing human systems and structures.[18] More frequent and more severe extreme weather events are more likely to destabilize ecosystems and cripple essential components of human livelihood, such as food production, transportation infrastructure, and water management. Death, disease, displacement, and economic hardship may follow, as we have seen with recent hurricanes, floods, heat waves, and droughts.

References

1. Meehl et al. 2009
2. Trewin and Vermont, 2010
3. Masters, 2010
4. SchŠr et al.2004
5. SchŠr et al. 2004
6. Stott et al. 2004
7. Karl et al. 2008
8. Trenberth 1999; Gutowski et al. 2008
9. Trenberth 1998, 2011
10. Gutowski et al. 2008, Allan and Soden 2008, and Min 2011
11. Tebaldi et al. 2006
12. Solomon et al. 2007, Stott et al. 2010, and Min et al. 2011
13. Tebaldi et al. 2006 and Christidis 2011
14. Min et al. 2011
15. Lazo et al 2010
16. Lott et al. 2011
17. NOAA 2011
18. Peterson et al. 2008

© 2016, Climate Communication | Contact Us
CLIMATE COMMUNICATION | Making Science Heard & Understood

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Science

NAME _____ **DATE** _____

Student Worksheet- Extreme Weather & Climate Change

Pre-reading questions:

1. Before you read the text on climate change and extreme weather, take a moment and consider what you might know already about the topic. How are climate change and extreme weather related?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. What are some of the extreme weather events that have become more frequent due to climate change?

4. How does global climate change make certain types of extreme weather more frequent or more intense?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What are some of the impacts to human well-being caused by climate-linked extreme weather?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

ACTIVITY PLAN

Sea Level Rise: Climate Change Impacts

Video

NOTE: It is strongly recommended that you read "How To Use These Materials" for additional support in teaching and adapting this media literacy activity.

Grade Level: Middle School

Objective Options:

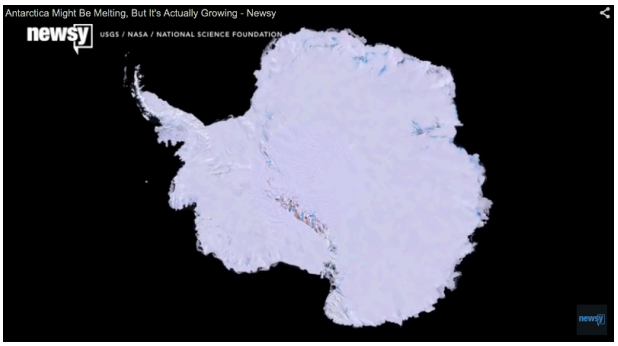
- Students will consider conflicting data on the contribution of polar melting to sea level rise.
- Students will reflect on the impact of sea level rise on people living in coastal cities.
- Students will read and analyze visual and print information in diverse texts related to the interconnections between sea level rise and climate change.
- Students will identify how scientific reports express technical information in a visual way.

Standards Options	
Next Generation Science Disciplinary Core Ideas	ESS2.D
	ESS3.D
C3 Framework Social Studies Dimension 2 Concepts	D2.Geo.2.6-8
	D2.Geo.8.6-8
Common Core ELA History, Social Studies and Science Standards	CCSS.ELA-LITERACY.RST.6-8.1
	CCSS.ELA-LITERACY.RST.6-8.6
	CCSS.ELA-LITERACY.RST.6-8.7

Vocabulary:

NASA, Intergovernmental Panel on Climate Change, sea level rise, climate change, ice mass, ICESat-2 mission, satellite altimeters,

Media Type(s): Internet video



New Study Shows Antarctica Actually Gaining Land Ice, Internet video, The International Forecaster, 2015 1:15 min.



NASA: sea levels rising as a result of human-caused climate change, Internet video, The Guardian, 2015 1:56 min.

Preparation and Materials:
*All materials can be downloaded from the PLS website (http://www.projectlooksharp.org). More URL details can be found in the *How to Use These Materials* section.

Preparation:
- Download and review the *How to Use These Materials* section associated with this kit.

Materials for the Lesson:
- Two-page *Student Handout: Oceans and Sea Level Rise*
- Two-age *Student Worksheet: Melting Ice and Sea Level Rise*
- Two videos

Additional Support:
- From the website, view Media Decoding Examples demonstrating classroom media analysis.
- Download the Key Questions for Analysis for supporting questions.
- *The Teacher's Guide to Media Literacy* and the Do-It-Yourself online guide are both available from the homepage.

Time: 10-40 minutes (dependent on number of questions used)

Activity Procedures:

- Have students read the *Student Handout* and complete the *Student Worksheet* for background information and credibility analysis and to assess prior knowledge. Review in class.

- Select among possible questions on the next page based on your objectives in teaching to science/social studies content and/or ELA/media literacy skills.

- Use the selected questions to lead students through a constructivist media decoding process of the two film clips. Example ELA and media literacy responses are included on the last page.

CONNECTIONS

Connections to Project Look Sharp Lesson Resources:
Media Constructions of Global Warming – Lesson 5: Sea Level Rise

Possible Questions for Media Document Decoding

Select among these based on your teaching objectives. Make questions document-based (i.e. According to this image or video…)

Science

- In what ways does the melting of polar ice contribute to sea level rise?
- What are some of the tools that scientists use to determine the complex factors that contribute to climate change?

Social Studies

- How do scientists use mapping techniques to predict future sea level rise associated with climate change?
- What are some of the likely impacts of sea level rise on human settlements?

ELA

- What messages are suggested about the interconnections between sea level rise and polar melting?
- What evidence do you see in the video to support your analysis?
- How do these reports express technical information in a visual way?

Media Literacy

- What is left out of this message that would be helpful to know?
- What are the sources of information and are they credible?
- What actions might you take in response to this media message?

Follow up Evidence Probe Questions & Comments

- Where do you see that?
- Say more about that
- How do you know that?
- What makes you say that?
- Does anyone have a different idea?
- What questions do you have about this?

Writing Prompt for Synthesis Assessment in the Sub-Topic, *El Nino*

Draw evidence from the handout and the videos to write about this question: "Why is it important to know about the specific causes of sea level rise?"

Example ELA and Media Literacy Responses

ELA

Questions: What messages are suggested about the interconnections between sea level rise and polar melting? What evidence do you see in the video to support your analysis?
Possible Answer: Doc 1: Parts of Antarctica are gaining ice and therefore southern polar melting is not contributing to sea level rise.
Evidence: The narrative: says, "A new study suggests…Antarctica is actually gaining ice mass due to snow and instead of driving seal level rise may actually be slowing it down." Images show vast ice fields as seen from above with no open water in sight.
Doc 2: Sea level rise is connected to polar melting.
Evidence: The narrator does not specifically mention polar melting as associated with sea level rise but there are many images of open ice areas with icebergs, ice breakers and maps of melting polar regions to strongly suggest that sea level rise and polar ice melting are connected.

Question: How do these reports express technical information in a visual way?
Answer: Doc 1: It shows an instrument labeled "Paleoclimate records" that separates chemical compounds when explaining NASA's study that contradicts IPCC findings. It shows a map of coastal Antarctica when explaining that parts of Antarctica are gaining ice. It shows filmed images of a research instrument and animations of a satellite when describing the ICESat-2 mission.
Doc 2: It shows a globe circled by many orbit lines when the scientist describes NASA's history of satellite measurement of earth changes. It shows the same animations of satellites as the first video when discussing satellite altimeters that measure sea level rise from space. It shows thermal mapping of the earth when talking about sea level rise and "human caused climate change." It shows a map of Greenland with pink coloring at the edge to suggest melting as the scientist talks about the statistics of sea level rise over recent decades.

Media Literacy

Question: What is left out of this message that would be helpful to know?
Possible Answers: Both documents – It would be helpful to know when each of these reports was made since new information may have arisen after they were produced to advance or contradict their claims. It would be helpful to know how the particular maps they chose are related to the points they are making. It would be helpful to know other scientists reactions to the studies that are referenced in each video.

Question: What are the sources of information and are they credible? What actions might you take in response to this media message?
Possible Answers: Both documents – reference NASA studies yet they suggest different conclusions about the connections between polar ice melting and sea level rise. The NASA study referenced in the first video and the NASA scientist speaking in the second seem to be credible since they reference work done by a Federal agency with lots of experience in earth science research. A clear further action after viewing the first video might be to read a summary of the study referenced in the first video and IPCC's response to that study. Further study in the second video would research what NASA has to say about polar climate melting and sea level rise rather than simply relying on the visual connections that link polar melting and sea level rise suggested in the video.

Home About Us Programs **Topics** Publications Resources Wiki Search

CLIMATE INSTITUTE



TOPICS / CORE ISSUES

- Climate Change
- Sea Level Rise
- Extreme Weather
- Ecosystems & Wildlife
- Air Quality
- Ozone Depletion
- Human Health
- Agriculture
- Water
- Environment and Security
- Energy
- Domestic Action
- International Action
- How You Can Help

OCEANS & SEA LEVEL RISE

Español
Français
中文
Deutsch
Italiano
Polski

Consequences of Climate Change on the Oceans

- *Melting of Glaciers and Ice Sheets*
- *Sea Level Rise*
- *Ocean Acidification*
- *Thermohaline Circulation*

Melting of Glaciers and Ice Sheets

One of the most pronounced effects of climate change has been melting of masses of ice around the world. Glaciers and ice sheets are large, slow-moving assemblages of ice that cover about 10% of the world's land area and exist on every continent except Australia. They are the world's largest reservoir of fresh water, holding approximately 75% (1).

Over the past century, most of the world's mountain glaciers and the ice sheets in both Greenland and Antarctica have lost mass. Retreat of this ice occurs when the mass balance (the difference between accumulation of ice in the winter versus ablation or melting in the summer) is negative such that more ice melts each year than is replaced (2). By affecting the temperature and precipitation of a particular area, both of which are key factors in the ability of a glacier to replenish its volume of ice, climate change affects the mass balance of glaciers and ice sheets. When the temperature exceeds a particular level or warm temperatures last for a long enough period, and/or there is insufficient precipitation, glaciers and ice sheets will lose mass.

One of the best-documented examples of glacial retreat has been on Mount Kilimanjaro in Africa. It is the tallest peak on the continent, and so, despite being located in the tropics, it is high enough so that glacial ice has been present for at least many centuries. However, over the past century, the volume of Mount Kilimanjaro's glacial ice has decreased by about 80% (3). If this rate of loss continues, its glaciers will likely disappear within the next decade (4). Similar glacial meltbacks are occurring in Alaska, the Himalayas, and the Andes.

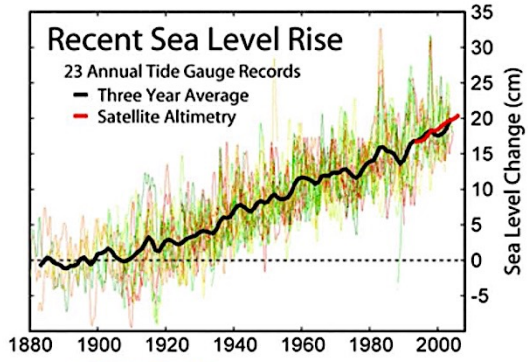


Image from wildwildweather.com

The Sea Level Rise Debate

Because the model simulations underestimate the sea level rise observed during the 20th century, significant debate has developed within the scientific community about IPCC's projections of sea level rise for the 21st century. The accuracy of the projections has been questioned for a variety of reasons, particularly relating to limitations of the model representations of the ice sheets, which do not account for the increase in ice sheet movement (i.e., dynamics) that occurs as ice sheets warm, mainly because the physics are not well understood.

There are also problems projecting how rapidly and how much global temperature will increase during the 21st century, in part due to the range of possible emissions. Because rising temperatures play a key role in all three of the terms that contribute to sea level rise, uncertainties in projections of global warming lead to uncertainties in projections of sea level rise (9).

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

Regarding thermal expansion, there remain questions about the amount of heat that has been taken up by the oceans. Part of the problem results from the various types of instruments that have been used over time to measure ocean temperatures- different instruments create different results. At present, simulations of 20th century heat uptake by the oceans and of the amount of sea level rise do not fully match, making it more difficult to project the amount of thermal expansion that can be expected in the 21st century.

Second, the uncertainties in the increase in temperature affect the ability to project the rate of melting of mountain glaciers and ice caps. Observations of the retreat of glaciers have been, in a number of situations, more rapid than models have simulated. Whether this is a result of inadequacies in the modeling or a possible increase in the rate of melting prompted by deposition of soot, or both or possibly other factors, is not yet clear.

Third, and most important, are uncertainties relating to the potential loss of ice from the Greenland and West Antarctic ice sheets. The dynamics of ice sheet movement are not well understood—some ice streams are moving very rapidly, suggesting the potential for contributions to sea level rise of order 10 mm/year or even larger, a rate that is far larger than any of the other terms. There seems even the possibility of a collapse of one or both ice sheets, especially if there is rapid loss of buttressing ice shelves that would reduce the resistance to ice stream flows (9). Capturing these processes accurately in climate models is extremely difficult, while omitting the process that is likely the most important contributor to sea level rise presents quite a quandary—the result being that IPCC's projections of sea level rise during the 21st century and beyond may be significantly too low.

Impacts of sea level rise

While there are obviously many challenges to projecting future sea level rise, even a seemingly small increase in sea level can have a dramatic impact on many coastal environments. Over 600 million people live in coastal areas that are less than 10 meters above sea level, and two-thirds of the world's cities that have populations over five million are located in these at-risk areas (12). With sea level projected to rise at an accelerated rate for at least several centuries, very large numbers of people in vulnerable locations are going to be forced to relocate. If relocation is delayed or populations do not evacuate during times when the areas are inundated by storm surges, very large numbers of environmental refugees are likely to result.

According to the IPCC, even the best-case scenarios indicate that a rising sea level would have a wide range of impacts on coastal environments and infrastructure. Effects are likely to include coastal erosion, wetland and coastal plain flooding, salinization of aquifers and soils, and a loss of habitats for fish, birds, and other wildlife and plants (11). The Environmental Protection Agency estimates that 26,000 square kilometers of land would be lost should sea level rise by 0.66 meters, while the IPCC notes that as much as 33% of coastal land and wetland habitats are likely to be lost in the next hundred years if the level of the ocean continues to rise at its present rate. Even more land would be lost if the increase is significantly greater, and this is quite possible (11). As a result, very large numbers of wetland and swamp species are likely at serious risk. In addition, species that rely upon the existence of sea ice to survive are likely to be especially impacted as the retreat accelerates, posing the threat of extinction for polar bears, seals, and some breeds of penguins (13).

Unfortunately, many of the nations that are most vulnerable to sea level rise do not have the resources to prepare for it. Low-lying coastal regions in developing countries such as Bangladesh, Vietnam, India, and China have especially large populations living in at-risk coastal areas such as deltas, where river systems enter the ocean. Both large island nations such as the Philippines and Indonesia and small ones such as Tuvalu and Vanuatu are at severe risk because they do not have enough land at higher elevations to support displaced coastal populations. Another possibility for some island nations is the danger of losing their fresh-water supplies as sea level rise pushes saltwater into their aquifers. For these reasons, those living on several small island nations (including the Maldives in the Indian Ocean and the Marshall Islands in the Pacific) could be forced to evacuate over the 21st century (11).

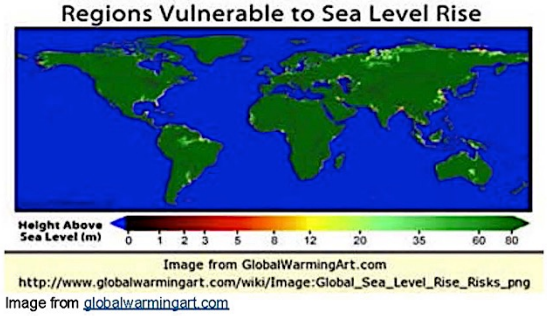


Image from globalwarmingart.com

Additional Resources

U.S. Geologic Survey's iCoast application shows coastal changes from extreme storms: USGS iCoast – Did the Coast Change?

Nicholls, R.J., P.P. Wong, V.R. Burkett, J.O. Codignotto, J.E. Hay, R.F. McLean, S. Ragoonaden and C.D. Woodroffe, 2007: Coastal systems and low-lying areas. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 315-356. http://www.ipcc-wg2.org/index.html

EPA. "Coastal Zones and Sea Level Rise." Updated 08 February 2008

Union of Concerned Scientists. "Highlights from the First Section of the IPCC Fourth Assessment Report."
Interactive sea level map: http://flood.firetree.net/

CMAR. Sea Level Rise: Understanding the past -- Improving projections for the future

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Melting Ice and Sea Level Rise

Pre-reading questions:

1. Before you read the text on polar ice and sea level rise, take a moment and consider what you might know already about the topic. How much does polar melting contribute to sea level rise?

2. Quickly scan the reading and pick out the major terms and topics that will be covered in this text. Write several key terms that you notice on this first quick read.

Post reading questions:

3. Complete the reading and answer the post reading questions. How does climate change affect the polar ice sheets?

4. What are some of the key aspects of the debate about sea level rise projections?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

5. What are some of the likely effects of rising sea levels?

6. Add 2 questions of your own about things you'd like to know more about related to this topic.

Source/references questions:

7. Who produced this web page? Is it a credible source? Why or why not? What would you need to know to assess the credibility of the information?

8. Look at the references list on the bottom. How do the references affect your rating of the credibility of the overall web page?

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

THEME 4:
Video Production

Sub-Topic: Sustainable Stories
- Lesson Plan 297
- Teacher Guide.....299
- Student Materials.....303

Sub-Topic: Sustainable Videos
- Lesson Plan 305
- Teacher Guide.....307
- Student Materials.....311

LESSON PLAN

Lesson 1: Sustainability Stories - Identifying Good Stories

Lesson Objectives:

- Students will consider how videos can inform and engage the public about sustainability issues and initiatives.
- Students will analyze two student-produced videos to distinguish key points of information.
- Students will identify local sustainability efforts they can report on.

NOTE: This lesson can standalone or be used as an introduction to *Lesson 2: Sustainability Videos: Start to Finish*. You should review Lesson 2 before delivering Lesson 1.

Standards	
Common Core ELA Standards	CCSS.ELA-LITERACY.RL.8.2
	CCSS.ELA-LITERACY.W.8.9
C3 Framework Social Studies Dimension 2 Concepts	D4.3.6-8
	D4.7.6-8
Next Generation Science Disciplinary Core Ideas	LS2.B
	ESS3.A

Vocabulary:
Domain Specific: sustainability, permaculture, pesticide, herbicide
Academic:

Media Type(s): video

Materials Needed:

- Four-page *Teacher's Guide: Sustainability Stories: Identifying Good Stories*
- College-produced video "To Plant a Seed"
- Youth-produced video "Parras Grades of Green"
- *One-page Student Worksheet: Finding the Facts*
- *One-page Student Worksheet: Facts About a Local Project*

Time: 90 minutes

Lesson Procedures

- Ask, "What does sustainability mean?" and "How is it related to our lives?"
- Present the *Lesson Introduction* to the class.
- View and discuss two short student-produced videos
- Direct students to complete the first worksheet, *Finding the Facts*
- Review student responses as a class and probe for evidence
- Ask, "How can we report on local sustainability initiatives?" and brainstorm community efforts addressing environmental issues.
- Direct students to finish the second worksheet, *Facts About a Local Project*
- Facilitate a class sharing where students pitch their proposed stories
- Lead a class reflection on what students learned

TEACHER GUIDE

Lesson 1: Sustainability Stories - Identifying Good Stories

1. Organize and make copies for the class activities.

CLASS DISCUSSION

2. Review sustainability topics covered prior to this lesson (if applicable). Ask, "What does sustainability mean?" and "How is it related to our lives?" Solicit a wide range of possible answers without critiquing or analyzing them. This is intended to be a brief opening exercise designed to get students thinking about sustainability and it's applications to their lived experiences.

3. You may want to introduce some of the key vocabulary for this lesson:

Sustainability: meeting the needs of people who live now without limiting the ability of people in the future to meet their own needs
Permaculture: a system of agriculture that draws on patterns and features in natural ecosystems and relies on renewable resources
Pesticide: a substance used for destroying insects or other organisms harmful to cultivated plants or animals
Herbicide: a substance or preparation for killing plants, especially weeds

4. Introduce the activity: Suggest a context such as the one provided below for the clue search in the media examples. Name the desired outcome.

Lesson Introduction

We are going to be sustainability movie journalists with the mission to document environmental efforts through video! We'll get inspiration from a segment of a video made by other middle school students and a full news video made by college students. We'll look at key facts within the videos and consider their overall purpose. Then, we'll come up with our own sustainability video ideas and pitch them to the class just like a news reporter might pitch a potential story to an editor.

5. Inform students you are going to show them two short student sustainability videos: 1) "To Plant a Seed": a college produced piece made for a student newspaper and 2) a segment of "Parras Grades of Green," a video made by middle schoolers as part of an environmental film competition. Play the videos back to back and lead a brief full class discussion with general questions such as "Why do you think these videos were made?" or "What are your initial reactions to these videos?" Encourage wide-ranging and creative responses.

6. Distribute the *Student Worksheet: Finding the Facts*. Give students access to watch the videos on their own or play them once more as a class once students have reviewed the worksheet questions. Have students work independently or in pairs to complete the worksheet. After students are finished, review their work using the *Student Response Questions & Answers* that follow. *Possible Answers* are included to model application of key knowledge through evidence-based analysis. Discuss answers as a class and probe for evidence to support their responses.

NOTE: Specific Common Core ELA and C3 Social Studies standards are addressed in the student worksheet in this collection.

Student Response Answers – Finding the Facts

Key Facts	"To Plant a Seed" College Video	"Parras Grades of Green" Middle School Video
Who is involved?	**Possible answer:** Ithaca College Students **Evidence:** • Title – "Senior Graham McInnis…" • Visuals – shows Graham and peers • Interview – Graham is the one speaking about the project	**Possible answer:** Students and staff at Parras Middle School **Evidence:** • Visuals – shows students speaking about their project • Script – "inform and educate students and staff about being trash free"
What sustainable project are they doing?	**Possible answer:** A rooftop community garden **Evidence:** • Title – "McInnis established a rooftop community garden…" • Visuals – shows students working on garden (wheelbarrow, dirt, etc.) • Interview – Graham is the one speaking about the project	**Possible answer:** a Trash Free Challenge **Evidence:** • Visuals – shows trash reduction with chalkboard drawings • Script – "I have been inspired by this trash free challenge"
Where are they doing their project?	**Possible answer:** On top of Ithaca College's Terrace Dining Hall **Evidence:** • Title – "located on top of Ithaca College's Terrace Dining Hall" • Visuals – shows "Terrace 1" door	**Possible answer:** Parras Middle School **Evidence:** • Visuals – shows students at school: outside, classroom, etc. • Script – "Here at Parras Middle School…"
Why is the project important?	**Possible answer:** Helps reconnect people to where their food comes from **Evidence:** • Interview – "We seem to be a little disconnected from our food systems… with something like this, if you can see the food grow… "	**Possible answer:** inspires students and staff to reduce waste at school **Evidence:** • Visuals – shows trash reduction with chalkboard drawings • Script – " we reduced lunchtime trash by 20 bags a day"

8. Come together as a class and ask, "What is our local community doing to support sustainability?" Brainstorm different actions students or their close family, friends and neighbors are taking to address environmental issues.

NOTE: This lesson can stand alone or be used as an introduction to Lesson 2: *Sustainability Videos: Start to Finish*. If you are going to have students make videos you should carefully consider the make up of the student pairs (or small groups of 3-4) given the video production tasks ahead.

9. Pair students up (divide into small groups of 3-4) and have them complete the *Student Worksheet: Facts About a Local Project*. Student answers will vary due to the personal focus. However, responses should address key story elements outlined and resemble answers put forth in the *Student Worksheet: Finding the Facts*. Once students are finished with the *Student Worksheet: Facts About a Local Project*, encourage them to share their story ideas with the class.

WRAP UP

10. Engage in a summary reflection activity. Ask students, "What have we learned about videos and the ways they inform and activate an audience?" Invite further inquiry by asking, "What else do we need to know to report on local sustainability projects effectively?" and "What sources might help us find out what we want to know?"

NOTE: If you're interested in having students go forth and produce short videos documenting sustainability initiatives refer to Theme 4, Lesson 2: *Sustainability Videos: Start to Finish*.

FURTHER QUESTIONS

Why is it important to document sustainability efforts?

What additional questions do you have about the videos we watched and the projects they focused on?

What information do you think was missing from the "To Plant a Seed" video and the "Parras Grades of Green" video? What questions would you ask to obtain such information?

EXTENDED ACTIVITIES

In this lesson we looked at how video can be used to document an initiative. Now that you have outlined facts about a local sustainability effort, what other ways may you be able to tell the story?

Video can be merely one part of a larger campaign to spread awareness about an environmental issue and get people involved. Find an online environmental campaign and analyze all of its parts to understand how they work together to provide information and ask for help.

Did the students in the videos you watched inspire you? If so, think of a sustainability project you could start yourself! What would you need to do to begin? Who could help you?

In the video "To Plant a Seed" the student Graham talks about how people are not connected with where their food comes from. Do you know where yours comes from? Keep a log of the food you eat and see if you can identify where it comes from. Investigate whether there are any local food sources near you and brainstorm ways to raise awareness around our foods origins.

In the video "Parras Grades of Green" the students researched the amount of waste they created at their school and took efforts to educate people and reduce trash. You could take these same steps at your school by investigating how much trash is currently produced and taking actions to minimize waste.

NAME _____ **DATE** _____

Student Worksheet- Finding the Facts

Task: Journalists make sure to include key facts when reporting on news and events in the community. You are the editor of these student videos and need to ensure they have all the necessary information before being published.

Key Facts	**"To Plant a Seed" College Video**	**"Parras Grades of Green" Middle School Video**
Who is involved?		
What sustainable project are they doing?		
Where are they doing their project?		
Why is the project important?		

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Facts About a Local Project

Task: You are now the journalist reporting on an inspiring sustainability project taking place in your community. Take the time to get all your facts before putting your report together as a polished piece.

Key Facts	**Your Report**
Who is involved?	
What sustainable project are they doing?	
Where are they doing their project?	
Why is the project important?	

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

LESSON PLAN

Lesson 2: Sustainability Videos: Start to Finish

Lesson Objectives:

- Students will analyze a student-produced video to identify message construction and technique.
- Students will discuss and collaboratively design a 1 minute, 6-shot video video message about a sustainability effort
- Students will go through the process of creating a short video including: scripting, making a shot sheet, planning, videotaping, editing and presenting their video

Standards	
Common Core ELA Standards	CCSS.ELA-LITERACY. W.8.3
	CCSS.ELA-LITERACY.W.8.10
C3 Framework Social Studies Dimension 2 Concepts	D4.3.6-8
	D4.7.6-8
Next Generation Science Disciplinary Core Ideas	ETS1.B
	ESS3.C

Vocabulary:

Domain Specific: script, storyboard, frame, shot, close-up shot, medium shot, wide shot, b-roll, stop motion animation, editing, audio, narration, video

Media Type(s): video

Materials Needed:

- Four-page *Teacher's Guide: Sustainability Videos: Start to Finish*
- College-produced video "To Plant a Seed"
- Youth-produced video "Parras Grades of Green"
- *One-page Student Worksheet: Production Research Plan*
- *One-page Student Worksheet: Presenting the Facts*
- *One-page Student Worksheet: Our Storyboard*
- *One-page Student Handout: Production Tips*
- *One-page Student Worksheet: Video Planning*
- Video Cameras - for each pair or group of students
- Computers for video editing

Time: 150 minutes

Lesson Procedures

- Have students get into the same pairs/groups as Lesson One and review their *Student Worksheet: Facts About a Local Project*
- Present the *Lesson Introduction* to the class.
- Ensure students ideas are feasible for video productions by having them complete the *Student Worksheet*: *Production Research Plan*
- Introduce key filming vocabulary and lead a media document decoding of the two student-produced videos, "To Plant a Seed" and "Parras Grades of Green," focusing on technique and message construction.
- Direct students to work in their pairs/groups to complete the *Student Worksheet: Presenting the Facts*, in which students script what they are going to say or ask others.
- Have pairs complete the *Student Worksheet: Our Story Board*, in which they sketch the 6 shots they will need.
- Encourage students to share their storyboards with the class and practice giving and receiving constructive feedback.
- Direct students to complete the third worksheet, *Video Planning* focusing on roles, timing and goals for production.
- Allow students time to film in class.
- Support students in editing their video clips.
- Lead a class video sharing and feedback around what makes good reporting about sustainability.

TEACHER GUIDE

Lesson 2: Sustainability Videos: Start to Finish

* Prior to this lesson you should teach Theme 4 "Lesson 1: *Sustainability Stories: Identifying Good Stories*, in which students begin to plan their video reports.
* Gather video and editing equipment. You can use many different devices for shooting video with sound including many computers, tablets, still cameras, and cell photos as well as video cameras. Consider how you will transfer the video to your computers for editing. You should also consider which editing program you will be using, such as iMovie (Mac), Moviemaker (PC) or an online editing program (e.g. YouTube Editor, WeVideo, or Animoto)
* If you do not have experience with video production it is suggested that you seek external technical support with filming and editing and consider making your own video first.

1. Organize and make copies for the class activities.

CLASS DISCUSSION

2. Have students get into the same pairs or small groups they formed at the end of Lesson 1: *Sustainability Stories: Identifying Good Stories* and review their completed *Student Worksheet: Facts About a Local Project*. Ask students to evaluate the feasibility of turning their ideas into video productions. You may want to ask, "Is the sustainability project local?" or "Are the people you have identified willing to be filmed?" This exercise is intended to be a review and to encourage students to start thinking about turning their ideas into videos. Planning will take thereafter.

3. Introduce the activity: Suggest a context such as the one provided below for the technique decoding of the media examples. Name the desired outcome.

Activity Introduction

We are going to make short 1-minute videos about sustainability efforts enacted by ourselves or those in our community (outlined in Lesson 1). We will first look at how the student producers of *To Plant a Seed* and *Parras Grades of Green* (shown in Lesson 1), put their videos together to inform how we construct our messages, and then we will plan, film and edit our own videos.

4. RESEARCH: Have each student pair/group prove their video idea is feasible by filling in the *Student Worksheet*: *Production Research Plan*. Students should choose a sustainability project that they can describe in approximately one minute to limit the complexity of the films. Once the research sheets are completed, have students share with the class and confirm the details with you.

5. VOCABULARY: Before viewing the videos, introduce some key filming vocabulary for this lesson:
Shot – video captured within a single camera recording, often has consistency in framing
Wide shot – framing used to establish location, can see a whole person and surrounding setting
Medium shot – framing often used to capture someone speaking, focuses on the waist up
Close-up shot – framing often used to show detail or emotion, only see part of a subject
B-roll – related video footage that is shown over an interview of a person
Stop motion animation –an object is moved or changed in small increments between individually photographed frames, creating the illusion of movement when the series of frames is played as a continuous sequence

6. ANAYSIS: Lead a full class document decoding of the two videos *To Plant a Seed* and *Parras Grades of Green* using the *Media Message Brainstorm Questions & Answers* that follow. Pause after playing *To Plant a Seed* and ask about the video's shot composition and b-role before moving on. When probing for messages *Possible Answers* are included to model application of key knowledge through evidence-based analysis.

Media Message Brainstorm

*In comparison to the content decoding of *To Plant a Seed* and *Parras Grades of Green* as outlined in Lesson One, this decoding will focus on filming technique and message construction to prepare students for filming their own stories.

Explain when and why b-role was used in "To Plant a Seed."	**Possible answers:** It was used over the interview footage so the viewer sees what the interviewee is talking about.
When were wide, medium and close-up shots used in "To Plant a Seed"? Why were they used?	**Possible answers:** Wide Shots - When students are working on the garden. These shots were wide to show the action of the students working with the wheelbarrow and each other. Medium Shots – When Graham is talking on camera. Medium shots were used here so the viewer can pay attention to what he is saying and see his facial gestures. Close-up Shots – When fertilizer bags are show. The close-up allowed the viewer to see the details of the bag and know it is fertilizer.
How were titles used in the two videos?	**Possible answer**: In "To Plant a Seed," titles were used in the beginning to provide a summary sentence about the video, under the interview to identify who was speaking, and at the end for credits. In "Parras Grades of Green" titles were used over students speaking to show the question they were addressing.
Where and why was stop-motion animation used in "Parras Grades of Green"?	**Possible answer**: Stop-motion animation was used when the producers were informing us about the success of the program. The eliminating garbage bins illustrated the waste reduction that occurred as a result of the program.
What would you do differently if you made the videos we saw to improve their quality?	**Possible answers**: Film Graham's interview in a quieter room to eliminate background noise ("To Plant a Seed"). Show students in action recycling or eating trash-free lunches ("Parras Grades of Green").

7. SCRIPTING: Once students have deeply deconstructed the example videos to better understand content presentation, have them write how they plan to convey key information in their video using the *Student Worksheet: Presenting the Facts*.

8. STORYBOARDING: Once students know how they will present their key facts through titles, interviews, or voiced statements, help them plan what visuals they will use by creating storyboards.

Have students complete the *Student Worksheet:* Our *Storyboard* where they will define what visuals they will need to film, find or create for each point they want to make. Limit students to 4 shots plus the title and credits if you want to keep it simple.

9. Have students present their storyboards to the class for feedback. When giving feedback, classmates should be encouraged to frame their critiques in a positive way, addressing elements they liked and bringing up suggested revisions through questions such as "I like how you clearly explained the project. Can you explain why you chose the visual you did to showcase the work?"

10. PLANNING: Once student have finished their storyboards pass out the *Student Handout – Production Tips* and review them as a class (or in pairs).

Have pairs fill in *Student Worksheet: Video Planning* so each student knows their roles and what needs to be done in the time you give them.

12. PRODUCTION: Filming time can vary depending on whether students are recording each other or including people outside of class. If others are involved, make sure to incorporate such considerations in the production scheduling. Give them approximately 30 minutes to record their narrated pieces in class, which should be around one minute. During this time they are also encouraged to start finding photos or recording short video clips that align with their six planned shots they sketched on their storyboards. If any students take on animation or more creative endeavors, you may want to encourage them to stay after school or experiment at home. As students work, walk around and provide structural and technical support where needed.

NOTE: If you have questions about copyright and fair use for students, refer to The Code of Best Practices in Fair Use for Media Literacy Education (a free, external resource).

13. EDITING: Help students import video footage they record and any photos they collect into a video-editing software program. For editing suggestions, refer to the *Student Handout – Production Tips* (reviewed before filming). After students have a finished video in the editing software, make sure to export their final piece and save it.

NOTE: Video editing programs have become very user friendly. Many middle school students may already have experience with video editing and can help their peers (and you). The editing software *Tutorial* or *Help* will explain how to import video images or video from the Internet and how to sync the narration with the images. You may need help in importing video from different devices into the editing computer but this too has become much easier. Make sure students save their final work correctly.

14. SCREENING: Come together and hold a class screening where students can show their videos and provide feedback on their finished products. Before each video is shown, have students present their work by giving a brief overview of what their film is about. After each piece, facilitate a 'producer's Q&A' by asking classmates to comment on specific elements they enjoy or asking questions about the video. These questions can be about the construction of the film or the sustainability initiative it focuses on. Some guiding questions you may want to post to students are included in the "Further Questions" section below.

FURTHER QUESTIONS

Based on feedback our classmates gave us, what could we do to improve our videos?

How could we share our videos outside the classroom to get others involved?

What was the most rewarding part of producing a video?

What was the most challenging part of producing a video?

EXTENDED ACTIVITIES

Taking the feedback you received from your peers and teacher, make revisions to your video so it can send an even stronger message!

Plan and hold a public screening of your videos to inform your community about the environmental issues you have been learning about.

To promote your public screening create additional media messages such as posters, flyers or social media posts encouraging family and friends to attend.

Youth Environmental Media Contests:
As an educator, you can encourage students to share their work with a broader audience by helping them submit to aligned contests, festivals and forums.

Additional ongoing youth environmental media contests include Green Living Project's Student Film Project and The National Wildlife Federation's Young Reporters for the Environment Competition.

When considering a contest make sure to read through all the stated parameters and get parental/guardian consent.

NAME _____ **DATE** _____

Student Handout- Production Tips

Filming Tips

- ✓ Know what you are going to film before you press record
- ✓ Look to see if any stray objects are in the frame before recording
- ✓ Listen for extra noises that may interfere with your video
- ✓ Use a tripod or sturdy surface if you want a steady shot
- ✓ Say "quiet on set" or "ready, set, action!" to make sure everyone is ready for recording
- ✓ Start to record 5 seconds before and after the shot you want to ultimately use in order to to give yourself ample room for editing later.
- ✓ Avoid fast zooming or drastic camera movement
- ✓ When on camera speak loud and clear
- ✓ After a take watch and listen to each shot to make sure the visuals and audio are what you want.

Editing Tips

- ✓ Import all video clips and photos into editing program at once if possible
- ✓ SAVE your editing project often!
- ✓ Before editing in timeline, eliminate clips that you will not use
- ✓ Arrange clips in timeline in the order you want before fine tune cutting
- ✓ Once your visuals are in place, you can record your audio narration right in the video-editing program so it fits perfectly with all your pieces!
- ✓ Add transitions, effects and additional audio after video clips are in place
- ✓ Add an opening title and closing credits

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Production Research Plan

Task: In order for your video idea to become a reality, it is helpful to guarantee all the parts are in place. Research and confirm the key pieces below to start your production off strong! Refer to your *Facts About a Local Project* worksheet to further develop your ideas.

1. **Who** do we want in our video? Are they willing to be filmed? How can we contact them?

2. **When** is the sustainability project we're interested in making a video about taking place? Will we be able to document it?

3. **Where** is the project happening? Can we get there easily?

4. Has there already been a video or article made about this project? If so, how will ours be different? How could we use existing media coverage to strengthen our video?

5. Do we have any other questions or pieces on information we want to look into to make our video a success?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Presenting the Facts

Task: In the two videos we watched, the student producers shared information about the sustainability projects they filmed in three specific ways… They either used 1) titles, 2) interviews, or 3) recorded statements. For each key fact, decide which method you will use and decide exactly 1) what you will write, 2) what you will ask, or 3) what you will say. Plan on your video presenting the facts in the same order as they are listed below. We will plan what visuals we want to support these facts in our storyboards.

Our Video title: _____

Key Facts	**We will use:**	**Our title, voiced statement, or interview question…**
1) Who is involved?	❑ A Title ❑ An Interview ❑ A Recorded Statement	
2) What sustainable project are they doing?	❑ A Title ❑ An Interview ❑ A Recorded Statement	
3) Where are they doing their project?	❑ A Title ❑ An Interview ❑ A Recorded Statement	
4) Why is the project important?	❑ A Title ❑ An Interview ❑ A Recorded Statement	

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

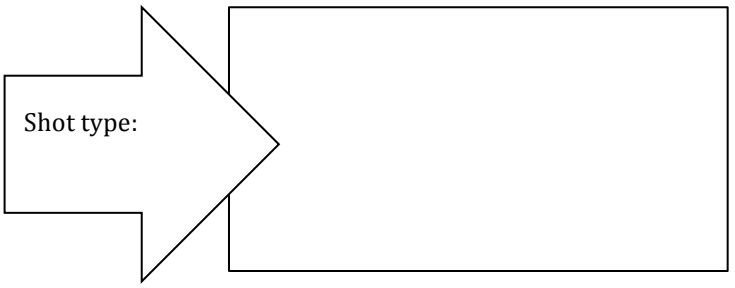
NAME _____ **DATE** _____

Student Worksheet- Our Storyboard

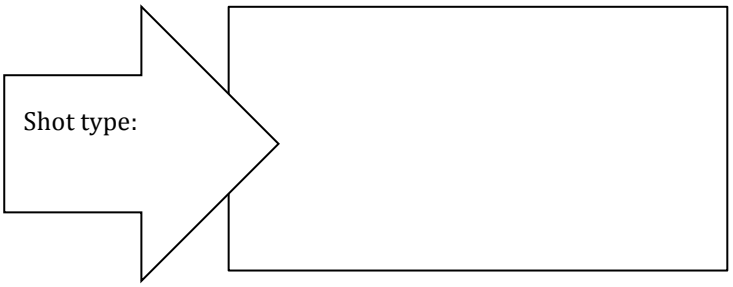
Task: A storyboard helps you visually plan what you want to film. For each script segment you have written, draw a sketch illustrating who/what will be in your frame and what shot you plan on using [some abbreviations: wide shot (ws), medium shot (ms), close up (cu), animation (a)].

Facts (draw from "Presenting the Facts" worksheet) **Sketches/Shots**

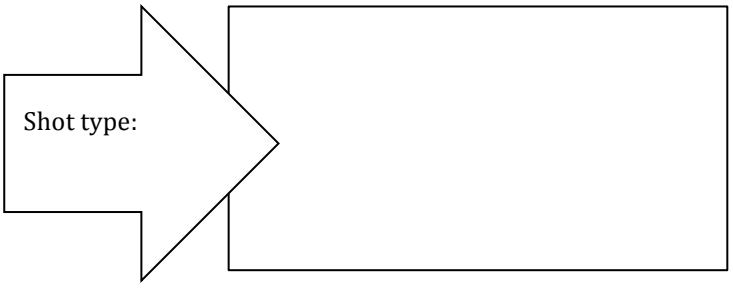
1. Write the title of your video



2. Introduce **who** is involved.

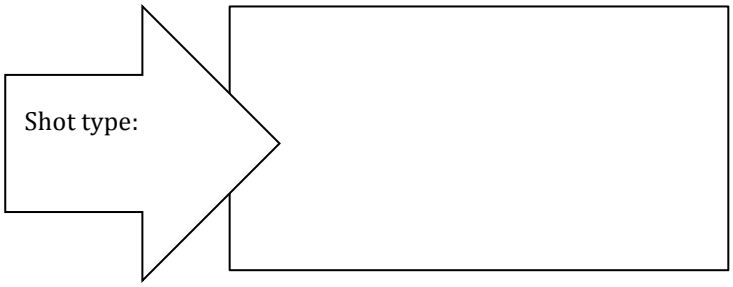


3. State **what** sustainable project they are doing.

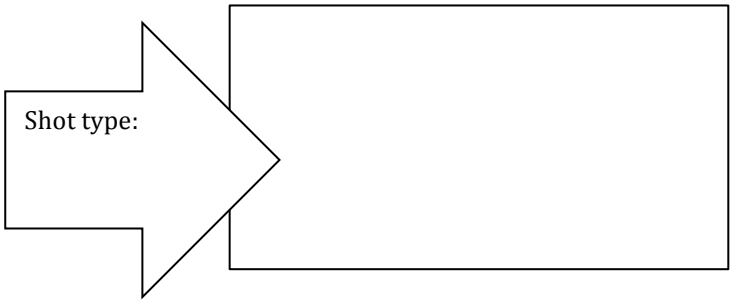


© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

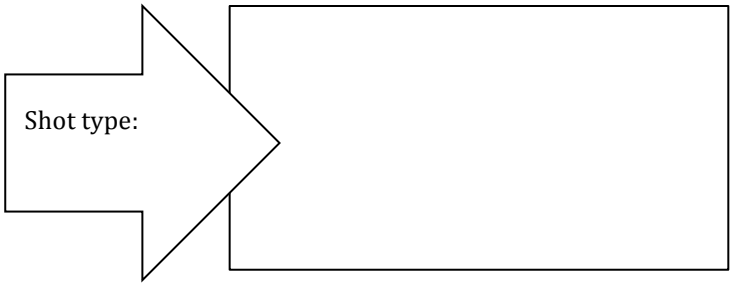
4. Identify **where** the project is taking place.



5. Explain **why** the project is important



7. List what credits you will include (who was involved in making your video, what citations or resources do you want to share?)



 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

NAME _____ **DATE** _____

Student Worksheet- Video Planning

Task: One last step of planning to complete before picking up the camera is to write down your plan of action. Fill in the following information and once it is complete you will be set begin recording!

Roles – Who will be recording? Who will be on camera? Who will be finding photos or music or doing animation (optional)?

Time – How much time do we have to film? Who will be keeping track of time?

Goals – What do we plan to finish filming in the time we are given? What order do we plan on filming our shots in?

© 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

 © 2015 Project Look Sharp – Ithaca College – School of Humanities and Sciences

Works Cited

Adams, Jonathan S. "Can Trophy Hunting Help Save Africa's Wild?" *Killing in the Name of Conservation*. The Breakthrough, 6 Jan. 2015. .

America's Endangered Species: Don't Say Good-bye. Perf. Susan Middleton and David Liitschager. *National Geographic Special*. , 1997. .

Backen, Lisa. "Drilling into Formation" *Journey of the Forsake* , 2012. .

Benoit, Peter. *The Exxon Valdez Oil Spill*. : Scholastic, 2011.

"Biodiversity and Climate Change." Alberta Biodiversity Monitoring Institute, . 4 May 2016.

"Biodiversity Loss." Paleontological Research Institution, . 4 May 2016.

Biofuels Disaster for Food, People and Planet. *Youube*. , 4 Apr. 2008. .

"Causes of Drought: What's the Climate Connection?" Union of Concerned Scientists, .

Chevron *Harpers* Nov. 1996:

"Chevron's Hawaiian Stilt Ad." Envirowatch, 2 Mar. 2008. n

"Climate Impacts on Water Resources." *Climate Change*. United States Environmental Protection Agency, 23 Feb. 2016. .

"Consequences of Climate Change on the Oceans." ClimateInstitute, . 4 May 2016.

"Consequences of Climate Change on the Oceans." ClimateInstitute, . 4 May 2016.

"Cover." *American Coal* 2006.

"Cover." *Home Power* Jan-Feb. 2015.

"Current Extreme Weather and Climate Change." *Climate Communication*, 2016. .

"Did You Know?" Queensland Resources Council, 17 Jan. 2016. .

"Drought: Threats to Water and Food Security." *Prepare for Drought*. Natural Resources Defense Council, .

Earth and the American Dream. Dir. Bill Coutrie. Direct Cinema Limited, 1993. Videocassette.

"The Effect of Climate Change on Water Resources and Programs." *Watershed Academy* . United States Environmental Protection Agency, . 4 May 2016.

"El Niño and Its Impact on Climate Change, Toll on Humans." *CBS This Morning*. 5 Ja 2016. .

Elwha River Restoration. National Parks Service, 1 June 2011. .

"Energy Explained." U.S. Energy Information Administration, . 3 May 2016.

Energy Tomorrow TV Spot, 'Connecting the Dots' American Petroleum, . 3 May 2016.

"Environmental Impact of Hydraulic Fracturing." *Wikipedia*. , 2016. .

"EPA Science Matters Newsletter: Climate Change and Watersheds: Exploring the Links." United States Environmental Protection Agency, Aug. 2013. .

"Extreme Weather and Climate Change." Union of Concerned Scientists, 2016. .

Facebook. Rainforest Action Network, 12 Dec. 2012. .

Foushee, Lea, and R. Gurneau. *Sacred Water: Water For Life*. : North American Water Office, 2010.

"Fracking, Climate Change and the Water Crisis." Food & Water Watch, Sept. 2012.

"Free the Rivers." Wild & Free Project, . 3 May 2016.

Furnas, Be *We Must Seize the Energy Opportunity or Slip Further Behind*. Rep. : Center For American Progress, 2009.

Gast, John. *American Progress*. 1872. *Slideshare*. . 4 May 2016.

A Gift from Nature, A Gift for Life. Malaysian Oil Palm Council, 19 Nov. 2007. .

Global Warming, El Niño Combine to Fuel Extreme World Weather. Voice of America, 8 Ja 2016. .

"Going Deep." Independent Petroleum Association of America, 2011. .

Goldman, Jason G. "U.S Carnivore Hunting Policies Are Scientifically Lacking." *Conservatio*n. University of Washington, 18 Dec. 2015. .

"The High Cost of Cheap Coal." *National Geographic* Mar. 2006: .

Hoan, C. Michael. "Habitat Destruction" *Encyclopedia of Earth*. , 22 July 2010. .

"How Coal Works." *Union of Concerned Scientists*. , . 3 May 2016.

"How Wind Energy Works." Union of Concerned Scientists, . 3 May 2016.

"Hydraulic Fracturing and Health." *National Institute of Environmental Health Sciences*. National Institute for Health, Dec. 2014. .

"Hydroelectric Power: How It Works." U.S. Department of the Interior U.S. Geological Survey, . 3 May 2016.

"Invasion of the Habitat Snatchers." *Virginia Invasive Species Council*. Virginia Department of Conservation and Recreation, .

"Invasive Species." Ational Wildlife Federation, .

King, Joyce Tekahnawiiaks. "The Value of Water and the Meaning of Water Law for the Native Americans Known as the Haudenosaunee." *Cornell Journal of Law and Public Policy* 16.3 (2007): .

Koster, Vera. "What Is Shale Gas? How Does Fracking Work?" *Chemistry Views*. , 5 Feb. 2013. .

Krech, Shepard, III. "Buffalo Tales: The Near-Extermination of the American Bison." *"Native Americans and the Land" Essays*. National Humanities Center, July 2001. .

Laurie, Julia. "California's Almonds Suck as Much Water Annually as Los Angeles Uses in Three Years." *Mother Jones*. , 12 Ja 2015. .

Lear, Linda. "Rachel Carson's Biography." *The Life & Legacy of Rachel Carson.* , 2015. .

Leininger, Sam. "Report Weeds." Clackamas Soil and Water Conservation District, 26 Mar. 2011. .

Living Together, Planet Earth. Dir. Alastair Fothergill. Perf. David Attenborough. BBC, 2007. DVD.

Mamit, Aaron. "California Drought Due to Natural Causes, Not Global Warming, Claims NOAA Report." Tech Times, 9 Dec. 2015. .

Mark Ruffalo PSA - Don't Frack Ohio. WaterDefense, 17 June 2012. .

Mathiesen, Karl. "Change Extreme Weather Already on Increase Due to Climate Change, Study Finds." The Guardian, 27 Apr. 2015. .

Maxwell, Steve, ed. *Business of Water*. : American Water Works Association, 2008.

Mazzotti, Frank J. "The Value of Endangered Species: The Importance of Conserving Biological Diversity." University of Florida, .

Mollins, Julie. "Scientific Review Shows Oil Palm Plantations Hurt Biodiversity." *Forest News*. , 20 Mar. 2014. .

NASA: Sea Levels Rising as a Result of Human-caused Climate Change. The Guardian, 27 Aug. 2015. .

The National Parks: America's Best Idea. Dir. Ken Burns. PBS, 2009. DVD.

New Study Shows Antarctica Actually Gaining Land Ice. By James Corbett. The International Forecaster, 4 Nov. 2015. .

Now Is the Time. National Corn Growers Association, 28 June 2010. .

Now Is the Time. National Corn Growers Association, 28 June 2010. .

"Nuclear Power Accidents: What Can Go Wrong?" Union of Concerned Scientists, . 3 May 2016.

"Nuclear Power Module." NuScale Power, . 3 May 2016.

O'Connor, Lydia. "A Big Culprit In California's Drought Starts With 'A' — And It's Not Almonds." *Huffington Post*. , 22 Apr. 2015. .

"Oil Spills: The Science Behind Cleanups." Oil Price, 15 Oct. 2009. .

Parras Grades of Green. Dir. Lily Sprangler. GLP Films, 2014. .

"Pros and Cons of Dam Removal." *Wikispaces*. , . 3 May 2016.

Rachel Carson's Silent Spring. *American Experience*. PBS, 1993. .

Saving Species. Perf. David Attenborough. *Planet Earth*. BBC, 2007. .

Schuttenhelm, Rolf. "NASA: Climate Change Leads to Enormous Ecosystem Shifts – 40% of Biomes Flip This Century." *Bits of Science*. , 11 Dec. 2011. .

The Silent Spring of Rachel Carson. CBS Reports. , 1963. .

"The Solar Resource." Union of Concerned Scientists, .

To Plant a Seed. Dir. Graham McInnis. Ithacan Online, 15 Dec. 2015. .

"Toxics And Endangered Species." Center For Biological Diversity, .

U. S. Crude Oil Exports. Rep. : American Petroleum Institute, 2015.

Valley of the Tennessee 1944. Office of War Information, 24 Dec. 2013. .

Warburg, Philip. *Harvest the Wind: : America's Journey to Jobs, Energy Independence, and Climate Stability*. : Beacon, 2013.

"Water and Climate Change." Climate Institute, .

"Water and Climate Change." *UN Water*. , 2014. .

Wells, Ken. "Where Tortoises and Solar Power Don't Mix." *Bloomberg Business Week* 10 Oct. 2012: .

"We're Developing Natural Gas." log post. *Media Blog*. America's Natural Gas Alliance, 2012. .

What Are You Really Bringing Back with You? Digital image. International Fund for Animal Welfare, 2007. .

"What Is an El Niño?" Ational Oceanic and Atmospheric Administration, .

"Where the Wild Things Aren't." *Facebook*. Rainforest Action Network, 12 Dec. 2012. .

"Which Countries Are Producing the Most Electricity from Renewable Resources?" *Http://compareelectricity.com*. , . 3 May 2016.

"Why Hydro?" National Hydropower Association, . 3 May 2016.

"Will the Development of Biofuels, Such as Ethanol, Reduce Greenhouse Gas Emissions?" *Pro Co* , 2008. .

Woodford, Chris. "How Does a Nuclear Power Plant Work?" *Explain That Stuff*. , . 3 May 2016.